

Compact Utility Tractors Repair Manual

TECHNICAL MANUAL

3120, 3320, 3520 and 3720 Compact Utility Tractors Without Cab Repair Manual


TM2138 23JAN13 (ENGLISH)

Introduction

Foreword

This manual is written for an experienced technician. Essential tools required in performing certain service work are identified in this manual and are recommended for use.

Live with safety: Read the safety messages in the introduction of this manual and the cautions presented throughout the text of the manual.

 This is the safety-alert symbol. When you see this symbol on the machine or in this manual, be alert to the potential for personal injury.

Technical manuals are divided in two parts: repair and operation and tests. Repair sections tell how to repair the components. Operation and tests sections help you identify the majority of routine failures quickly.

Information is organized in groups for the various components requiring service instruction. At the beginning of each group are summary listings of all applicable essential tools, service equipment and tools, other materials needed to do the job, service parts kits, specifications, wear tolerances, and torque values.

Technical Manuals are concise guides for specific machines. They are on-the-job guides containing only the vital information needed for diagnosis, analysis, testing, and repair.

Fundamental service information is available from other sources covering basic theory of operation, fundamentals of troubleshooting, general maintenance, and basic type of failures and their causes.

DX,TMIFC -19-29SEP98-1/1

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Section 10 Safety

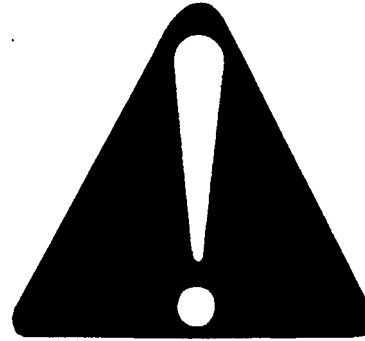
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Recognize Safety Information

This is a safety-alert symbol. When you see this symbol on your machine or in this manual, be alert to the potential for personal injury.

Follow recommended precautions and safe operating practices.



T81389 —UN—07DEC88

DX,ALERT -19-29SEP98-1/1

Understand Signal Words

A signal word—DANGER, WARNING, or CAUTION—is used with the safety-alert symbol. DANGER identifies the most serious hazards.

DANGER or WARNING safety signs are located near specific hazards. General precautions are listed on CAUTION safety signs. CAUTION also calls attention to safety messages in this manual.

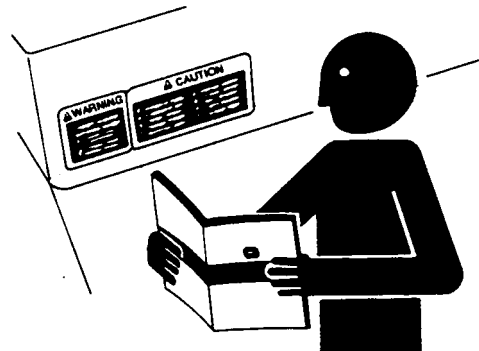


TS187 —19—30SEP88

DX,SIGNAL -19-03MAR93-1/1

Replace Safety Signs

Replace missing or damaged safety signs. See the machine operator's manual for correct safety sign placement.



TS201 —UN—15APR13

DX,SIGNS1 -19-04JUN90-1/1

Handle Fluids Safely—Avoid Fires

When you work around fuel, do not smoke or work near heaters or other fire hazards.

Store flammable fluids away from fire hazards. Do not incinerate or puncture pressurized containers.

Make sure machine is clean of trash, grease, and debris.

Do not store oily rags; they can ignite and burn spontaneously.



TS227 —UN—15APR13

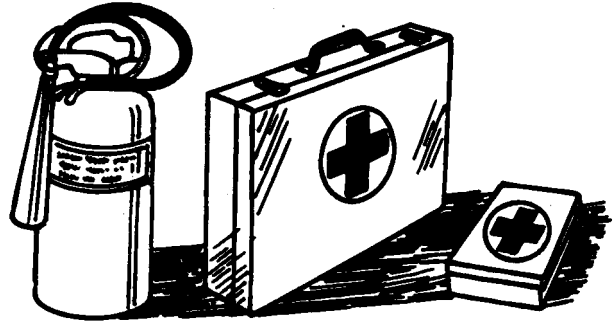
DX,FLAME -19-29SEP98-1/1

Prepare for Emergencies

Be prepared if a fire starts.

Keep a first aid kit and fire extinguisher handy.

Keep emergency numbers for doctors, ambulance service, hospital, and fire department near your telephone.



TS291 —UN—15APR13

DX,FIRE2 -19-03MAR93-1/1

Prevent Battery Explosions

Keep sparks, lighted matches, and open flame away from the top of battery. Battery gas can explode.

Never check battery charge by placing a metal object across the posts. Use a volt-meter or hydrometer.

Do not charge a frozen battery; it may explode. Warm battery to 16°C (60°F).



TS204 —UN—15APR13

DX,SPARKS -19-03MAR93-1/1

Prevent Acid Burns

Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, eat holes in clothing, and cause blindness if splashed into eyes.

Avoid the hazard by:

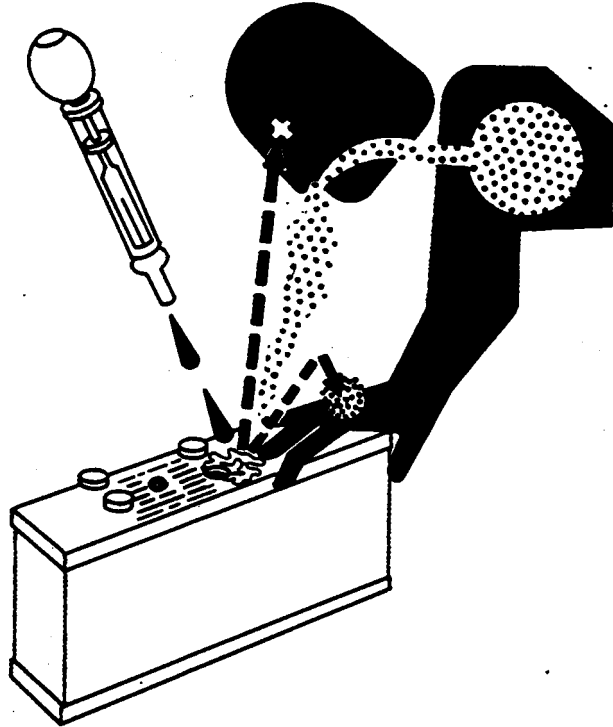
1. Filling batteries in a well-ventilated area.
2. Wearing eye protection and rubber gloves.
3. Avoiding breathing fumes when electrolyte is added.
4. Avoiding spilling or dripping electrolyte.
5. Use proper jump start procedure.

If you spill acid on yourself:

1. Flush your skin with water.
2. Apply baking soda or lime to help neutralize the acid.
3. Flush your eyes with water for 15—30 minutes. Get medical attention immediately.

If acid is swallowed:

1. Do not induce vomiting.
2. Drink large amounts of water or milk, but do not exceed 2 L (2 quarts).
3. Get medical attention immediately.



TS203 —UN—23AUG88

DX,POISON -19-21APR93-1/1

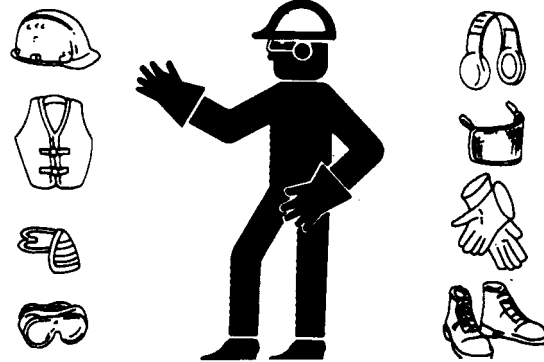
Wear Protective Clothing

Wear close fitting clothing and safety equipment appropriate to the job.

Prolonged exposure to loud noise can cause impairment or loss of hearing.

Wear a suitable hearing protective device such as earmuffs or earplugs to protect against objectionable or uncomfortable loud noises.

Operating equipment safely requires the full attention of the operator. Do not wear radio or music headphones while operating machine.



TS206 —UN—15APR13

DX,WEAR -19-10SEP90-1/1

Avoid High-Pressure Fluids

Inspect hydraulic hoses periodically – at least once per year – for leakage, kinking, cuts, cracks, abrasion, blisters, corrosion, exposed wire braid or any other signs of wear or damage.

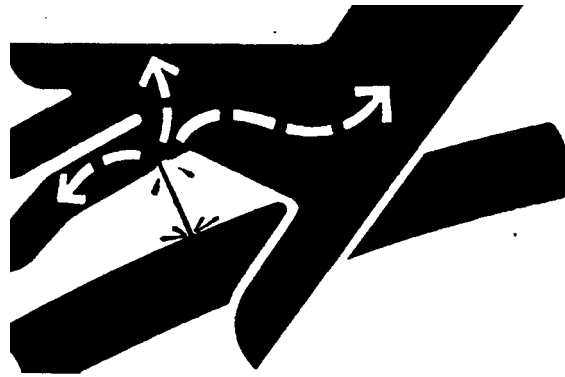
Replace worn or damaged hose assemblies immediately with John Deere approved replacement parts.

Escaping fluid under pressure can penetrate the skin causing serious injury.

Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure.

Search for leaks with a piece of cardboard. Protect hands and body from high-pressure fluids.

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar



with this type of injury should reference a knowledgeable medical source. Such information is available in English from Deere & Company Medical Department in Moline, Illinois, U.S.A., by calling 1-800-822-8262 or +1 309-748-5636.

DX,FLUID -19-12OCT11-1/1

X9811 —UN—23AUG88

Avoid Heating Near Pressurized Fluid Lines

Flammable spray can be generated by heating near pressurized fluid lines, resulting in severe burns to yourself and bystanders. Do not heat by welding, soldering, or using a torch near pressurized fluid lines or other flammable materials. Pressurized lines can accidentally burst when heat goes beyond the immediate flame area.



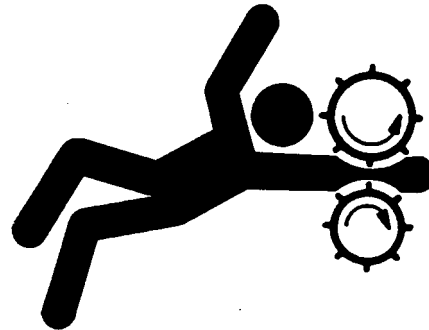
DX,TORCH -19-10DEC04-1/1

TS953 —UN—15MAY90

Service Machines Safely

Tie long hair behind your head. Do not wear a necktie, scarf, loose clothing, or necklace when you work near machine tools or moving parts. If these items were to get caught, severe injury could result.

Remove rings and other jewelry to prevent electrical shorts and entanglement in moving parts.



DX,LOOSE -19-04JUN90-1/1

TS228 —UN—23AUG88

Use Proper Tools

Use tools appropriate to the work. Makeshift tools and procedures can create safety hazards.

Use power tools only to loosen threaded parts and fasteners.

For loosening and tightening hardware, use the correct size tools. DO NOT use U.S. measurement tools on metric fasteners. Avoid bodily injury caused by slipping wrenches.

Use only service parts meeting John Deere specifications.



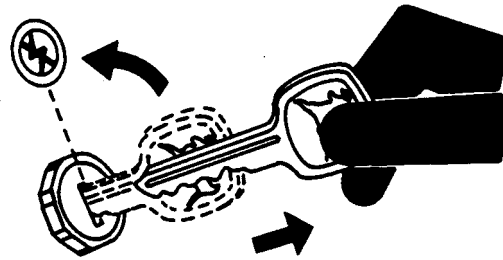
TS779 —UN—08NOV89

DX,REPAIR -19-17FEB99-1/1

Park Machine Safely

Before working on the machine:

- Lower all equipment to the ground.
- Stop the engine and remove the key.
- Disconnect the battery ground strap.
- Hang a "DO NOT OPERATE" tag in operator station.



TS230 —UN—24MAY89

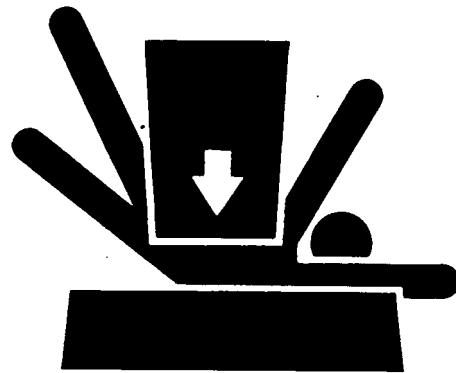
DX,PARK -19-04JUN90-1/1

Support Machine Properly

Always lower the attachment or implement to the ground before you work on the machine. If the work requires that the machine or attachment be lifted, provide secure support for them. If left in a raised position, hydraulically supported devices can settle or leak down.

Do not support the machine on cinder blocks, hollow tiles, or props that may crumble under continuous load. Do not work under a machine that is supported solely by a jack. Follow recommended procedures in this manual.

When implements or attachments are used with a machine, always follow safety precautions listed in the implement or attachment operator's manual.



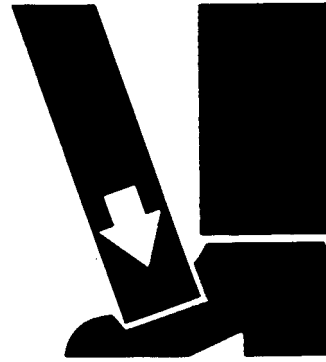
TS229 —UN—23AUG88

DX,LOWER -19-24FEB00-1/1

Use Proper Lifting Equipment

Lifting heavy components incorrectly can cause severe injury or machine damage.

Follow recommended procedure for removal and installation of components in the manual.



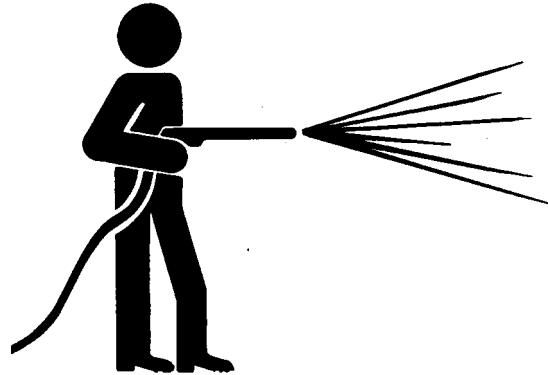
TS2226 —UN—23AUG88

DX,LIFT -19-04JUN90-1/1

Work in Clean Area

Before starting a job:

- Clean work area and machine.
- Make sure you have all necessary tools to do your job.
- Have the right parts on hand.
- Read all instructions thoroughly; do not attempt shortcuts.



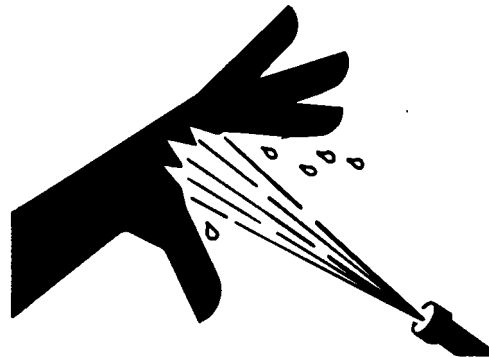
T6642EJ —UN—18OCT88

DX,CLEAN -19-04JUN90-1/1

Protect Against High Pressure Spray

Spray from high pressure nozzles can penetrate the skin and cause serious injury. Keep spray from contacting hands or body.

If an accident occurs, see a doctor immediately. Any high pressure spray injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable medical source. Such information is available from Deere & Company Medical Department in Moline, Illinois, U.S.A.



TS1343 —UN—18MAR92

DX,SPRAY -19-16APR92-1/1

Illuminate Work Area Safely

Illuminate your work area adequately but safely. Use a portable safety light for working inside or under the machine. Make sure the bulb is enclosed by a wire cage. The hot filament of an accidentally broken bulb can ignite spilled fuel or oil.



TS223 —UN—23AUG88

DX,LIGHT -19-04JUN90-1/1

Work In Ventilated Area

Engine exhaust fumes can cause sickness or death. If it is necessary to run an engine in an enclosed area, remove the exhaust fumes from the area with an exhaust pipe extension.

If you do not have an exhaust pipe extension, open the doors and get outside air into the area.



TS220 —UN—15APR13

DX,AIR -19-17FEB99-1/1

Remove Paint Before Welding or Heating

Avoid potentially toxic fumes and dust.

Hazardous fumes can be generated when paint is heated by welding, soldering, or using a torch.

Remove paint before heating:

- Remove paint a minimum of 100 mm (4 in.) from area to be affected by heating. If paint cannot be removed, wear an approved respirator before heating or welding.
- If you sand or grind paint, avoid breathing the dust. Wear an approved respirator.
- If you use solvent or paint stripper, remove stripper with soap and water before welding. Remove solvent or paint stripper containers and other flammable material from area. Allow fumes to disperse at least 15 minutes before welding or heating.

Do not use a chlorinated solvent in areas where welding will take place.



TS220 —UN—15APR13

Do all work in an area that is well ventilated to carry toxic fumes and dust away.

Dispose of paint and solvent properly.

DX,PAINT -19-24JUL02-1/1

Avoid Harmful Asbestos Dust

Avoid breathing dust that may be generated when handling components containing asbestos fibers. Inhaled asbestos fibers may cause lung cancer.

Components in products that may contain asbestos fibers are brake pads, brake band and lining assemblies, clutch plates, and some gaskets. The asbestos used in these components is usually found in a resin or sealed in some way. Normal handling is not hazardous as long as airborne dust containing asbestos is not generated.

Avoid creating dust. Never use compressed air for cleaning. Avoid brushing or grinding material containing asbestos. When servicing, wear an approved respirator. A special vacuum cleaner is recommended to clean asbestos. If not available, apply a mist of oil or water on the material containing asbestos.



Keep bystanders away from the area.

DX,DUST -19-15MAR91-1/1

TS220 —UN—15APR13

Service Tires Safely

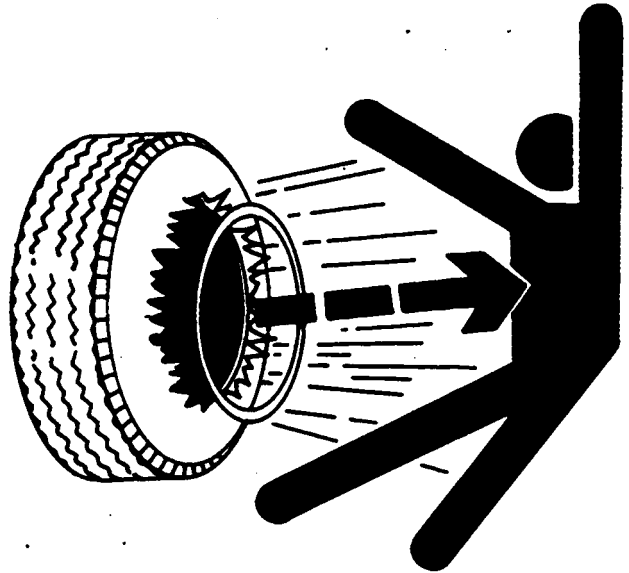
Explosive separation of a tire and rim parts can cause serious injury or death.

Do not attempt to mount a tire unless you have the proper equipment and experience to perform the job.

Always maintain the correct tire pressure. Do not inflate the tires above the recommended pressure. Never weld or heat a wheel and tire assembly. The heat can cause an increase in air pressure resulting in a tire explosion. Welding can structurally weaken or deform the wheel.

When inflating tires, use a clip-on chuck and extension hose long enough to allow you to stand to one side and NOT in front of or over the tire assembly. Use a safety cage if available.

Check wheels for low pressure, cuts, bubbles, damaged rims or missing lug bolts and nuts.



DX,RIM -19-24AUG90-1/1

TS211 —UN—15APR13

Stay Clear of Rotating Drivelines

Entanglement in rotating driveline can cause serious injury or death.

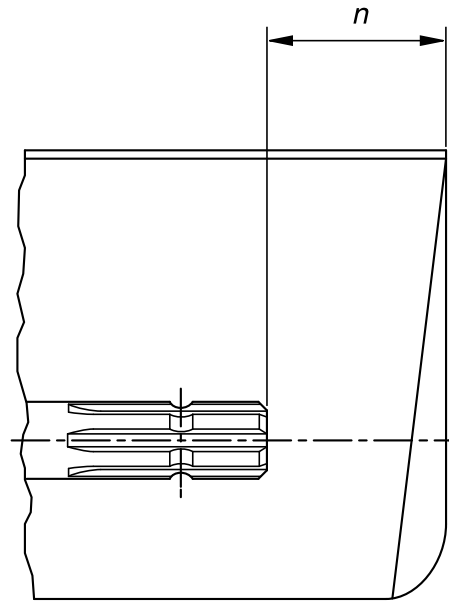
Keep tractor master shield and driveline shields in place at all times. Make sure rotating shields turn freely.

Wear close fitting clothing. Stop the engine and be sure that PTO driveline is stopped before making adjustments, connections, or cleaning out PTO driven equipment.

Do not install any adapter device between the tractor and the primary implement PTO drive shaft that will allow a 1000 rpm tractor shaft to power a 540 rpm implement at speeds higher than 540 rpm.

Do not install any adapter device that results in a portion of the rotating implement shaft, tractor shaft, or the adapter to be unguarded. The tractor master shield shall overlap the end of the splined shaft and the added adaptor device as outlined in the table.

PTO Type	Diameter	Splines	$n \pm 5 \text{ mm (0.20 in.)}$
1	35 mm (1.378 in.)	6	85 mm (3.35 in.)
2	35 mm (1.378 in.)	21	85 mm (3.35 in.)
3	45 mm (1.772 in.)	20	100 mm (4.00 in.)



TS1644 —UN—22AUG95

H96219 —UN—29APR10

DX,PTO -19-30JUN10-1/1

Service Cooling System Safely

Explosive release of fluids from pressurized cooling system can cause serious burns.

Shut off engine. Only remove filler cap when cool enough to touch with bare hands. Slowly loosen cap to first stop to relieve pressure before removing completely.



TS281 —UN—15APR13

DX,RCAP -19-04JUN90-1/1

Dispose of Waste Properly

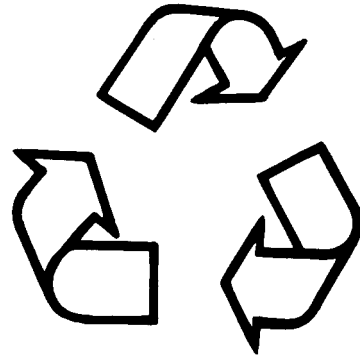
Improperly disposing of waste can threaten the environment and ecology. Potentially harmful waste used with John Deere equipment include such items as oil, fuel, coolant, brake fluid, filters, and batteries.

Use leakproof containers when draining fluids. Do not use food or beverage containers that may mislead someone into drinking from them.

Do not pour waste onto the ground, down a drain, or into any water source.

Air conditioning refrigerants escaping into the air can damage the Earth's atmosphere. Government regulations may require a certified air conditioning service center to recover and recycle used air conditioning refrigerants.

Inquire on the proper way to recycle or dispose of waste from your local environmental or recycling center, or from your John Deere dealer.



TS1133 —UN—15APR13

DX,DRAIN -19-03MAR93-1/1

Handle Chemical Products Safely

Direct exposure to hazardous chemicals can cause serious injury. Potentially hazardous chemicals used with John Deere equipment include such items as lubricants, coolants, paints, and adhesives.

A Material Safety Data Sheet (MSDS) provides specific details on chemical products: physical and health hazards, safety procedures, and emergency response techniques.

Check the MSDS before you start any job using a hazardous chemical. That way you will know exactly what the risks are and how to do the job safely. Then follow procedures and recommended equipment.

(See your John Deere dealer for MSDS's on chemical products used with John Deere equipment.)



TS1132 —UN—15APR13

DX,MSDS,NA -19-03MAR93-1/1

Live With Safety

Before returning machine to customer, make sure machine is functioning properly, especially the safety systems. Install all guards and shields.



TS231 —19—07OCT88

DX,LIVE -19-25SEP92-1/1

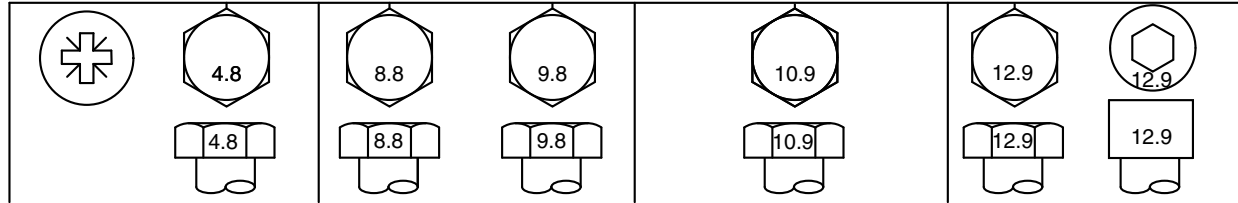
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Metric Bolt and Screw Torque Values

TS1670 —UN—01MAY03



Bolt or Screw Size	Class 4.8				Class 8.8 or 9.8				Class 10.9				Class 12.9			
	Lubricated ^a		Dry ^b		Lubricated ^a		Dry ^b		Lubricated ^a		Dry ^b		Lubricated ^a		Dry ^b	
	N·m	lb.-in.	N·m	lb.-in.	N·m	lb.-in.	N·m	lb.-in.	N·m	lb.-in.	N·m	lb.-in.	N·m	lb.-in.	N·m	lb.-in.
M6	4.7	42	6	53	8.9	79	11.3	100	13	115	16.5	146	15.5	137	19.5	172
									N·m	lb.-ft.	N·m	lb.-ft.	N·m	lb.-ft.	N·m	lb.-ft.
M8	11.5	102	14.5	128	22	194	27.5	243	32	23.5	40	29.5	37	27.5	47	35
			N·m	lb.-ft.	N·m	lb.-ft.	N·m	lb.-ft.								
M10	23	204	29	21	43	32	55	40	63	46	80	59	75	55	95	70
	N·m	lb.-ft.														
M12	40	29.5	50	37	75	55	95	70	110	80	140	105	130	95	165	120
M14	63	46	80	59	120	88	150	110	175	130	220	165	205	150	260	190
M16	100	74	125	92	190	140	240	175	275	200	350	255	320	235	400	300
M18	135	100	170	125	265	195	330	245	375	275	475	350	440	325	560	410
M20	190	140	245	180	375	275	475	350	530	390	675	500	625	460	790	580
M22	265	195	330	245	510	375	650	480	725	535	920	680	850	625	1080	800
M24	330	245	425	315	650	480	820	600	920	680	1150	850	1080	800	1350	1000
M27	490	360	625	460	950	700	1200	885	1350	1000	1700	1250	1580	1160	2000	1475
M30	660	490	850	625	1290	950	1630	1200	1850	1350	2300	1700	2140	1580	2700	2000
M33	900	665	1150	850	1750	1300	2200	1625	2500	1850	3150	2325	2900	2150	3700	2730
M36	1150	850	1450	1075	2250	1650	2850	2100	3200	2350	4050	3000	3750	2770	4750	3500

Torque values listed are for general use only, based on the strength of the bolt or screw. DO NOT use these values if a different torque value or tightening procedure is given for a specific application. For stainless steel fasteners or for nuts on U-bolts, see the tightening instructions for the specific application. Tighten plastic insert or crimped steel type lock nuts by turning the nut to the dry torque shown in the chart, unless different instructions are given for the specific application.

Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical property class. Replace fasteners with the same or higher property class. If higher property class fasteners are used, tighten these to the strength of the original. Make sure fastener threads are clean and that you properly start thread engagement. When possible, lubricate plain or zinc plated fasteners other than lock nuts, wheel bolts or wheel nuts, unless different instructions are given for the specific application.

^a"Lubricated" means coated with a lubricant such as engine oil, fasteners with phosphate and oil coatings, or M20 and larger fasteners with JDM F13C, F13F or F13J zinc flake coating.

^b"Dry" means plain or zinc plated without any lubrication, or M6 to M18 fasteners with JDM F13B, F13E or F13H zinc flake coating.

DX,TORQ2 -19-12JAN11-1/1

Metric Cap Screw Torque Values—Grade 7

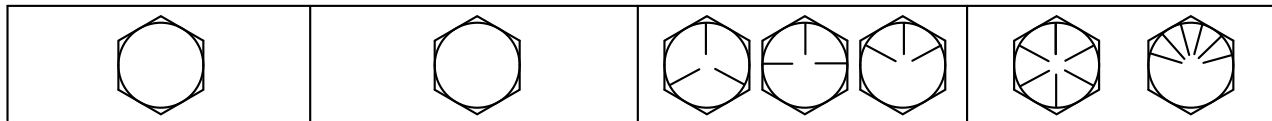
NOTE: When bolting aluminum parts, tighten to 80% of torque specified in table.

Size	N·m	(lb.-ft)
M6	9.5—12.2	(7—9)
M8	20.3—27.1	(15—20)
M10	47.5—54.2	(35—40)
M12	81.4—94.9	(60—70)
M14	128.8—146.4	(95—108)
M16	210.2—240	(155—177)

AG,OUO1048,861 -19-02AUG00-1/1

Unified Inch Bolt and Screw Torque Values

TS1671 —UN—01MAY03



Bolt or Screw Size	SAE Grade 1				SAE Grade 2 ^a				SAE Grade 5, 5.1 or 5.2				SAE Grade 8 or 8.2			
	Lubricated ^b		Dry ^c		Lubricated ^b		Dry ^c		Lubricated ^b		Dry ^c		Lubricated ^b		Dry ^c	
	N·m	lb.-in.	N·m	lb.-in.	N·m	lb.-in.	N·m	lb.-in.	N·m	lb.-in.	N·m	lb.-in.	N·m	lb.-in.	N·m	lb.-in.
1/4	3.7	33	4.7	42	6	53	7.5	66	9.5	84	12	106	13.5	120	17	150
													N·m	lb.-ft.	N·m	lb.-ft.
5/16	7.7	68	9.8	86	12	106	15.5	137	19.5	172	25	221	28	20.5	35	26
									N·m	lb.-ft.	N·m	lb.-ft.				
3/8	13.5	120	17.5	155	22	194	27	240	35	26	44	32.5	49	36	63	46
			N·m	lb.-ft.	N·m	lb.-ft.	N·m	lb.-ft.								
7/16	22	194	28	20.5	35	26	44	32.5	56	41	70	52	80	59	100	74
	N·m	lb.-ft.														
1/2	34	25	42	31	53	39	67	49	85	63	110	80	120	88	155	115
9/16	48	35.5	60	45	76	56	95	70	125	92	155	115	175	130	220	165
5/8	67	49	85	63	105	77	135	100	170	125	215	160	240	175	305	225
3/4	120	88	150	110	190	140	240	175	300	220	380	280	425	315	540	400
7/8	190	140	240	175	190	140	240	175	490	360	615	455	690	510	870	640
1	285	210	360	265	285	210	360	265	730	540	920	680	1030	760	1300	960
1-1/8	400	300	510	375	400	300	510	375	910	670	1150	850	1450	1075	1850	1350
1-1/4	570	420	725	535	570	420	725	535	1280	945	1630	1200	2050	1500	2600	1920
1-3/8	750	550	950	700	750	550	950	700	1700	1250	2140	1580	2700	2000	3400	2500
1-1/2	990	730	1250	930	990	730	1250	930	2250	1650	2850	2100	3600	2650	4550	3350

Torque values listed are for general use only, based on the strength of the bolt or screw. DO NOT use these values if a different torque value or tightening procedure is given for a specific application. For plastic insert or crimped steel type lock nuts, for stainless steel fasteners, or for nuts on U-bolts, see the tightening instructions for the specific application. Shear bolts are designed to fail under predetermined loads. Always replace shear bolts with identical grade.

Replace fasteners with the same or higher grade. If higher grade fasteners are used, tighten these to the strength of the original. Make sure fastener threads are clean and that you properly start thread engagement. When possible, lubricate plain or zinc plated fasteners other than lock nuts, wheel bolts or wheel nuts, unless different instructions are given for the specific application.

^aGrade 2 applies for hex cap screws (not hex bolts) up to 6 in. (152 mm) long. Grade 1 applies for hex cap screws over 6 in. (152 mm) long, and for all other types of bolts and screws of any length.

^b"Lubricated" means coated with a lubricant such as engine oil, fasteners with phosphate and oil coatings, or 7/8 in. and larger fasteners with JDM F13C, F13F or F13J zinc flake coating.

^c"Dry" means plain or zinc plated without any lubrication, or 1/4 to 3/4 in. fasteners with JDM F13B, F13E or F13H zinc flake coating.

DX,TORQ1 -19-12JAN11-1/1

Gasket Sealant Application

Cleaning—Clean both surfaces that will be joined using 100% isopropyl alcohol. Wipe excess off with a clean cloth. Cleaner/degreaser can be substituted for isopropyl alcohol.

How to Dispense, Apply, and Assemble Gasket Sealants—Dispense approximately 29.5 to 59.1 mm (1 to 2 oz.) of flexible form-in-place gasket on a clean sheet or table top. Avoid using excess amounts that may be exposed for long periods of time. This will help prevent contamination from surrounding atmosphere such as dust with metal content.

Using an ink roller or similar device, apply to one surface of the joint by loading the roller from a plastic sheet and transferring the material in a thin film to the joint.

The application should be the thinnest film possible, but providing complete coverage. This can be judged by the appearance of the joint once it is put together. Excessive amounts of material will cause incorrect bearing end play, extend cure time, and will cause runoff of the material. A small bead or buildup at the joint is permissible and indicates good dispersion through the joint. Excess can be wiped from the joint. Joining should take place within three minutes after sealant application.

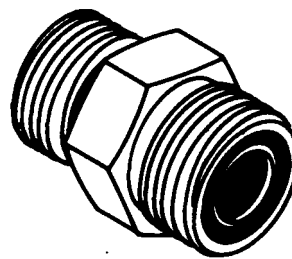
Apply proper cap screw torque and sequence as applicable. Allow a minimum of 30 minutes before air test or adding oil for test stand usage.

Disassembly—Cured material can be removed with a wire brush or scraper. Chemical cleaners are available for use, should they be deemed necessary.

AA95137.00023E5 -19-23AUG10-1/1

Service Recommendations For Flat Face O-Ring Seal Fittings

1. Inspect the fitting sealing surfaces. They must be free of dirt or defects.
2. Inspect O-ring. It must be free of damage or defects.
3. Lubricate O-rings and install into groove using petroleum jelly to hold in place.
4. Push O-ring into the groove with plenty of petroleum jelly so O-ring is not displaced during assembly.
5. Index angle fittings and tighten by hand, by pressing joint together to insure O-ring remains in place.
6. Tighten fitting or nut to torque value shown on the chart per dash size stamped on the fitting. Do not allow hoses to twist when tightening fittings.



T6243AD —UN—18OCT88

FLAT FACE O-RING SEAL FITTING TORQUE^a

Tube Size Outside Diameter	Dash Size	Thread Size	Swivel Nut Torque	Bulkhead Nut Torque
mm (in.)		in.	N•m (lb-ft)	N•m (lb-ft)
6.35 (1/4)	-4	9/16-18	16 (12)	5 (3.5)
9.52 (3/8)	-6	11/16-16	24 (18)	9 (6.5)
12.70 (1/2)	-8	13/16-16	50 (37)	17 (12.5)
15.88 (5/8)	-10	1-14	69 (51)	17 (12.5)
19.05 (3/4)	-12	1-3/16-12	102 (75)	17 (12.5)
22.22 (7/8)	-14	1-3/16-12	102 (75)	17 (12.5)
25.40 (1)	-16	1-7/16-12	142 (105)	17 (12.5)
31.75 (1-1/4)	-20	1-11/16-12	190 (140)	17 (12.5)
38.10 (1-1/2)	-24	2-12	217 (160)	17 (12.5)

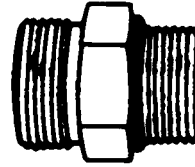
^aThe torque values shown are based on lubricated connections as in reassembly.

AG,OUOMX005,234 -19-30SEP98-1/1

Service Recommendations for O-Ring Boss Fittings

STRAIGHT FITTING

1. Inspect O-ring boss seat for dirt or defects.
2. Lubricate O-ring with petroleum jelly. Place electrical tape over threads to protect O-ring. Slide O-ring over tape and into O-ring groove of fitting. Remove tape.
3. Tighten fitting to torque value shown on chart.

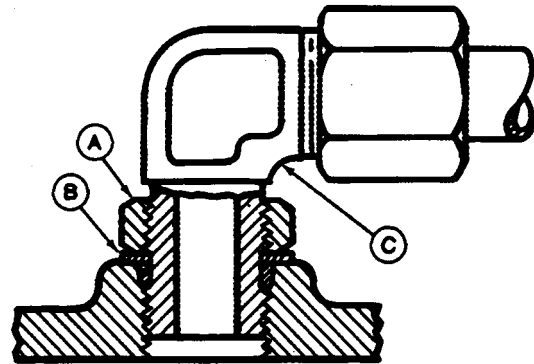


T6243AE —UN—15APR13

TX,90,DY323A -19-02MAY96-1/2

ANGLE FITTING

1. Back-off lock nut (A) and back-up washer (B) completely to head-end (C) of fitting.
2. Turn fitting into threaded boss until back-up washer contacts face of boss.
3. Turn fitting head-end counterclockwise to proper index (maximum of one turn).
4. Hold fitting head-end with a wrench and tighten locknut and back-up washer to proper torque value.



T6520AB —UN—15APR13

NOTE: Do not allow hoses to twist when tightening fittings.

TORQUE VALUE			
Thread Size		N-m	lb-ft
3/8-24	UNF	8	6
7/16-20	UNF	12	9
1/2-20	UNF	16	12
9/16-18	UNF	24	18
3/4-16	UNF	46	34
7/8-14	UNF	62	46
1-1/16-12	UN	102	75
1-3/16-12	UN	122	90
1-5/16-12	UN	142	105
1-5/8-12	UN	190	140
1-7/8-12	UN	217	160

NOTE: Torque tolerance is $\pm 10\%$.

TX,90,DY323A -19-02MAY96-2/2

Diesel Fuel

Consult your local fuel distributor for properties of the diesel fuel available in your area.

In general, diesel fuels are blended to satisfy the low temperature requirements of the geographical area in which they are marketed.

Diesel fuels specified to EN 590 or ASTM D975 are recommended. Renewable diesel fuel produced by hydrotreating animal fats and vegetable oils is basically identical to petroleum diesel fuel. Renewable diesel that meets EN 590 or ASTM D975 is acceptable for use at all percentage mixture levels.

Required Fuel Properties

In all cases, the fuel shall meet the following properties:

Cetane number of 43 minimum. Cetane number greater than 47 is preferred, especially for temperatures below -20°C (-4°F) or elevations above 1500 m (5000 ft.).

Cold Filter Plugging Point (CFPP) should be at least 5°C (9°F) below the expected lowest temperature or **Cloud Point** below the expected lowest ambient temperature.

Fuel lubricity should pass a maximum scar diameter of 0.45 mm as measured by ASTM D6079 or ISO 12156-1.

Diesel fuel quality and sulfur content must comply with all existing emissions regulations for the area in which the engine operates. DO NOT use diesel fuel with sulfur content greater than 10 000 mg/kg (10 000 ppm).

Sulfur content for Interim Tier 4 and Stage III B engines

- Use ONLY ultra low sulfur diesel (ULSD) fuel with a maximum of 15 mg/kg (15 ppm) sulfur content.

Sulfur Content for Tier 3 and Stage III A Engines

- Use of diesel fuel with sulfur content less than 1000 mg/kg (1000 ppm) is RECOMMENDED
- Use of diesel fuel with sulfur content 1000–5000 mg/kg (1000–5000 ppm) REDUCES oil and filter change intervals.
- BEFORE using diesel fuel with sulfur content greater than 5000 mg/kg (5000 ppm), contact your John Deere dealer

Sulfur Content for Tier 2 and Stage II Engines

- Use of diesel fuel with sulfur content less than 500 mg/kg (500 ppm) is RECOMMENDED.
- Use of diesel fuel with sulfur content 500–5000 mg/kg (500–5000 ppm) REDUCES the oil and filter change interval
- BEFORE using diesel fuel with sulfur content greater than 5000 mg/kg (5000 ppm), contact your John Deere dealer

Sulfur Content for Other Engines

- Use of diesel fuel with sulfur content less than 5000 mg/kg (5000 ppm) is recommended.
- Use of diesel fuel with sulfur content greater than 5000 mg/kg (5000 ppm) REDUCES the oil and filter change intervals.

IMPORTANT: Do not mix used diesel engine oil or any other type of lubricating oil with diesel fuel.

IMPORTANT: Improper fuel additive usage may cause damage on fuel injection equipment of diesel engines.

DX,FUEL1 -19-11APR11-1/1

Handling and Storing Diesel Fuel

⚠ CAUTION: Reduce the risk of fire. Handle fuel carefully. DO NOT fill the fuel tank when engine is running. DO NOT smoke while you fill the fuel tank or service the fuel system.

Fill the fuel tank at the end of each day's operation to prevent water condensation and freezing during cold weather.

Keep all storage tanks as full as practicable to minimize condensation.

Ensure that all fuel tank caps and covers are installed properly to prevent moisture from entering. Monitor water content of the fuel regularly.

When using biodiesel fuel, the fuel filter may require more frequent replacement due to premature plugging.

Check engine oil level daily prior to starting engine. A rising oil level may indicate fuel dilution of the engine oil.

IMPORTANT: The fuel tank is vented through the filler cap. If a new filler cap is required, always replace it with an original vented cap.

When fuel is stored for an extended period or if there is a slow turnover of fuel, add a fuel conditioner to stabilize the fuel and prevent water condensation. Contact your fuel supplier for recommendations.

DX,FUEL4 -19-14APR11-1/1

Diesel Engine Oil

Use oil viscosity based on the expected air temperature range during the period between oil changes.

John DeerePlus-50™ II oil is preferred.

John Deere Plus-50™ is also recommended.

Other oils may be used if they meet one or more of the following:

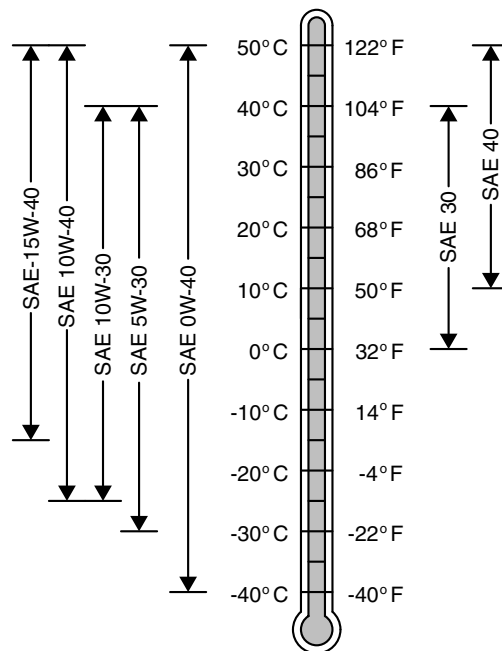
- John Deere Torq-Gard™
- API Service Category CJ-4
- API Service Category CI-4 PLUS
- API Service Category CI-4
- API Service Category CH-4
- API Service Category CG-4
- API Service Category CF-4
- ACEA Oil Sequence E9
- ACEA Oil Sequence E7
- ACEA Oil Sequence E6
- ACEA Oil Sequence E5
- ACEA Oil Sequence E4
- ACEA Oil Sequence E3
- ACEA Oil Sequence E2

If oils meeting API CG-4, API CF-4, or ACEA E2 are used, reduce the service interval by 50%.

Multi-viscosity diesel engine oils are preferred.

Diesel fuel quality and fuel sulfur content must comply with all existing emissions regulations for the area in which the engine operates.

Plus-50 is a trademark of Deere & Company
Torq-Gard is a trademark of Deere & Company



Oil Viscosities for Air Temperature Ranges

If diesel fuel with sulfur content greater than 5000 mg/kg (5000 ppm) is used, reduce the service interval by 50%.

DO NOT use diesel fuel with sulfur content greater than 10 000 mg/kg (10 000 ppm).

TS1687 —UN—18JUL07

DX,ENOIL -19-14APR11-1/1

Diesel Engine Break-In Oil

New engines are filled at the factory with either John Deere Break-In™ or John Deere Break-In Plus™ Engine Oil. During the break-in period, add John Deere Break-In™ or Break-In Plus™ Engine Oil, respectively, as needed to maintain the specified oil level.

Operate the engine under various conditions, particularly heavy loads with minimal idling, to help seat engine components properly.

If John Deere Break-In Engine Oil is used during the initial operation of a new or rebuilt engine, change the oil and filter at a maximum of 250 hours.

If John Deere Break-In Plus Engine Oil is used, change the oil and filter at a minimum of 100 hours and a maximum equal to the interval specified for John Deere Plus-50™ II or Plus-50 oil.

After engine overhaul, fill the engine with either John Deere Break-In™ or Break-In Plus™ Engine Oil.

If John Deere Break-In or Break-In Plus Engine Oil is not available, use an SAE 10W-30 viscosity grade diesel engine oil meeting one of the following and change the oil and filter at a maximum of 100 hours of operation:

- API Service Classification CE
- API Service Classification CD

*Break-In is a trademark of Deere & Company.
Break-In Plus is a trademark of Deere & Company
Plus-50 is a trademark of Deere & Company.*

- API Service Classification CC
- ACEA Oil Sequence E2
- ACEA Oil Sequence E1

IMPORTANT: Do not use Plus-50™ II, Plus-50 or engine oils meeting any of the following for the initial break-in of a new or rebuilt engine:

API CJ-4	ACEA E9
API CI-4 PLUS	ACEA E7
API CI-4	ACEA E6
API CH-4	ACEA E5
API CG-4	ACEA E4
API CF-4	ACEA E3
API CF-2	
API CF	

These oils will not allow the engine to break in properly.

John Deere Break-In Plus™ Engine Oil can be used for all John Deere diesel engines at all emission certification levels.

After the break-in period, use John Deere Plus-50™ II, John Deere Plus-50, or other diesel engine oil as recommended in this manual.

DX,ENOIL4 -19-20APR11-1/1

Alternative and Synthetic Lubricants

Conditions in certain geographical areas may require lubricant recommendations different from those printed in this manual.

Some John Deere brand coolants and lubricants may not be available in your location.

Consult your John Deere dealer to obtain information and recommendations.

Synthetic lubricants may be used if they meet the performance requirements as shown in this manual.

The temperature limits and service intervals shown in this manual apply to both conventional and synthetic lubricants.

Re-refined base stock products may be used if the finished lubricant meets the performance requirements.

DX,ALTER -19-11APR11-1/1

Lubricant Storage

Your equipment can operate at top efficiency only when clean lubricants are used.

Use clean containers to handle all lubricants.

Store lubricants and containers in an area protected from dust, moisture, and other contamination. Store containers on their side to avoid water and dirt accumulation.

Make certain that all containers are properly marked to identify their contents.

Properly dispose of all old containers and any residual lubricant they may contain.

DX,LUBST -19-11APR11-1/1

Mixing of Lubricants

In general, avoid mixing different brands or types of oil. Oil manufacturers blend additives in their oils to meet certain specifications and performance requirements.

Mixing different oils can interfere with the proper functioning of these additives and degrade lubricant performance.

Consult your John Deere dealer to obtain specific information and recommendations.

DX,LUBMIX -19-18MAR96-1/1

Grease

Use grease based on NLGI consistency numbers and the expected air temperature range during the service interval.

John Deere SD Polyurea Grease is preferred.

The following greases are also recommended:

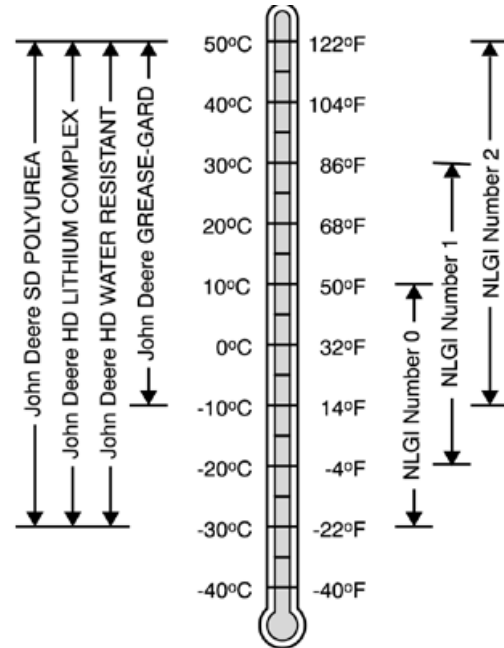
- John Deere HD Lithium Complex Grease
- John Deere HD Water Resistant Grease
- John Deere GREASE-GARD™

Other greases may be used if they meet the following:

- NLGI Performance Classification GC-LB

IMPORTANT: Some types of grease thickeners are not compatible with others. Consult your grease supplier before mixing different types of grease.

GREASE-GARD is a trademark of Deere & Company



Greases for Air Temperature Ranges

TS1673 —UN—31OCT03

DX,GREA1 -19-14APR11-1/1

Transmission and Hydraulic Oil

Use oil viscosity based on the expected air temperature range during the period between oil changes.

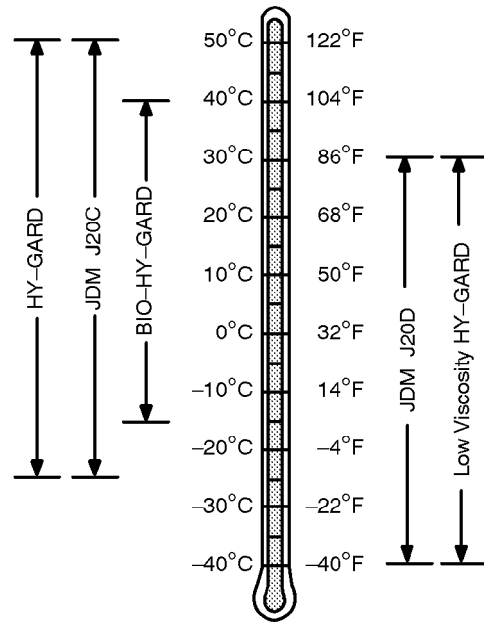
The following oils are preferred:

- John Deere HY-GARD™
- John Deere Low Viscosity HY-GARD™

Other oils may be used if they meet one of the following:

- John Deere Standard JDM J20C
- John Deere Standard JDM J20D

Use John Deere BIO-HY-GARD™ oil when a biodegradable fluid is required.¹



HY-GARD is a trademark of Deere & Company
BIO-HY-GARD is a trademark of Deere & Company

¹ BIO-HY-GARD meets or exceeds the minimum biodegradability of 80% within 21 days according to CEC-L-33-T-82 test method. BIO-HY-GARD should not be mixed with mineral oils, because this reduces the biodegradability and makes proper oil recycling impossible.

TS1660 —UN—10OCT97

DX,ANTI -19-07NOV03-1/1

Heavy Duty Diesel Engine Coolant

The engine cooling system is filled to provide year-round protection against corrosion and cylinder liner pitting, and winter freeze protection to -37°C (-34°F). If protection at lower temperatures is required, consult your John Deere dealer for recommendations.

The following engine coolants are preferred:

- John Deere COOL-GARD™ II Premix
- John Deere COOL-GARD II PG Premix

Use John Deere COOL-GARD II PG Premix when a non-toxic coolant formulation is required.

Additional Recommended Coolants

The following engine coolant is also recommended:

- John Deere COOL-GARD II Concentrate in a 40–60% mixture of concentrate with quality water.

John Deere COOL-GARD II Premix, COOL-GARD II PG Premix, and COOL-GARD II Concentrate coolants do not require use of supplemental coolant additives.

Other Coolants

John Deere COOL-GARD II and COOL-GARD II PG coolants might not be available in the geographical area where service is performed.

If these coolants are unavailable, use a coolant concentrate or prediluted coolant intended for use with heavy duty diesel engines and with a minimum of the following chemical and physical properties:

COOL-GARD is a trademark of Deere & Company

- Is formulated with a quality nitrite-free additive package.
- Provides cylinder liner cavitation protection according to either the John Deere Cavitation Test Method or a fleet study run at or above 60% load capacity
- Protects the cooling system metals (cast iron, aluminum alloys, and copper alloys such as brass) from corrosion

The additive package must be part of one of the following coolant mixtures:

- ethylene glycol or propylene glycol base prediluted (40—60%) heavy duty coolant
- ethylene glycol or propylene glycol base heavy duty coolant concentrate in a 40—60% mixture of concentrate with quality water

Water Quality

Water quality is important to the performance of the cooling system. Distilled, deionized, or demineralized water is recommended for mixing with ethylene glycol and propylene glycol base engine coolant concentrate.

IMPORTANT: Do not use cooling system sealing additives or antifreeze that contains sealing additives.

Do not mix ethylene glycol and propylene glycol base coolants.

Do not use coolants that contain nitrites.

DX,COOL3 -19-14APR11-1/1

Serial Numbers

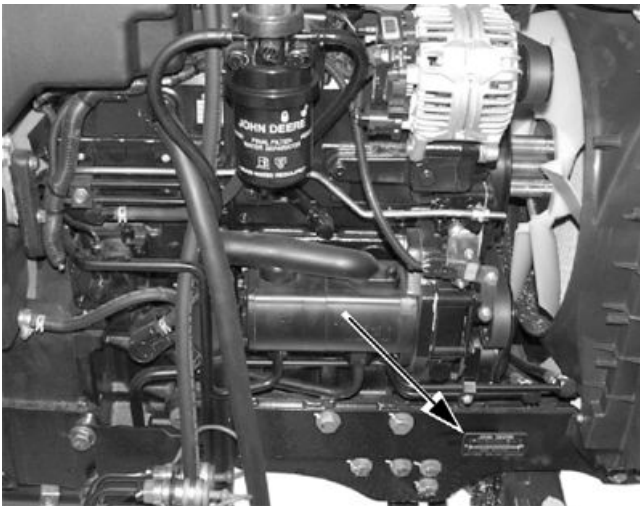
When ordering parts or submitting a warranty claim, it is IMPORTANT that the machine product identification

number (PIN) and component serial numbers are included. The location of the PIN, engine, and turbocharger serial numbers are shown.

OUC1023,0002E9C -19-10FEB11-1/1

Machine Product Identification Number

The machine's product identification number plate is located on the right side of the machine.

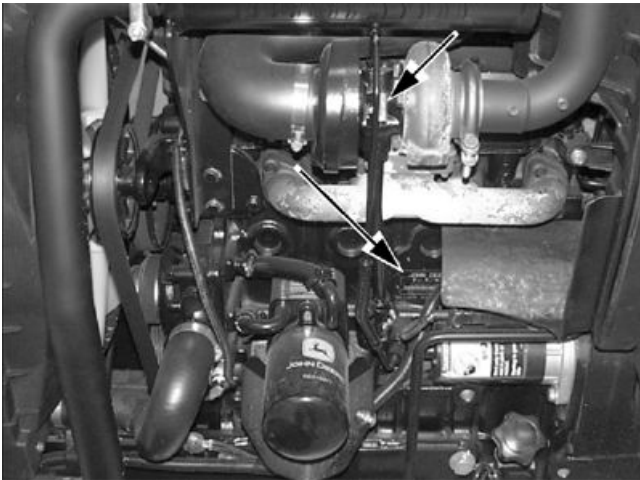


LVAL11526 —UN—24AUG10

OUC1023,0002E9D -19-10FEB11-1/1

Engine and Turbocharger Serial Numbers

The engine serial number plate and turbocharger serial number plate are located on the left side of the engine.



LVAL11527 —UN—24AUG10

OUC1023,0002E9E -19-10FEB11-1/1

Section 30 Engine

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General Specifications

Item	Measurement	Specification
Model 3120		
Engine	Yanmar	3TNV84
4-Cycle Diesel	Torque (at rated speed) @ 2600 rpm	75.4 N·m (55.6 lb.-ft.)
	Torque (max) @ 1560 rpm	90.4 N·m (66.7 lb.-ft.)
Cylinders	Quantity	3
Bore	Diameter	84 mm (3.31 in.)
Stroke	Distance	90 mm (3.54 in.)
Size	Displacement	1.496 L (91.3 cu. in.)
Model 3320		
Engine	Yanmar	3TNV88
4-Cycle Diesel	Torque (at rated speed) @ 2600 rpm	83.5 N·m (61.6 lb.-ft.)
	Torque (max) @ 1560 rpm	100.2 N·m (73.9 lb.-ft.)
Cylinders	Quantity	3
Bore	Diameter	88 mm (3.46 in.)
Stroke	Distance	90 mm (3.54 in.)
Size	Displacement	1.642 L (100.2 cu. in.)
Model 3520		
Engine	Yanmar	3TNV84T
4-Cycle Diesel	Torque (at rated speed) @ 2600 rpm	96.4 N·m (71.1 lb.-ft.)
	Torque (max) @ 1560 rpm	115.7 N·m (85.4 lb.-ft.)
Bore	Diameter	84 mm (3.31 in.)
Stroke	Distance	90 mm (3.54 in.)
Size	Displacement	1.496 L (91.3 cu. in.)
Model 3720		
Engine	Yanmar	3TNV84HT
4-Cycle Diesel	Torque (at rated speed) @ 2600 rpm	114.3 N·m (84.3 lb.-ft.)
	Torque (max) @ 1560 rpm	137.1 N·m

Continued on next page

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Specifications

Item	Measurement	Specification
		(101.1 lb.-ft.)
Bore	Diameter	84 mm (3.31 in.)
Stroke	Distance	90 mm (3.54 in.)
Size	Displacement	1.496 L (91.3 cu. in.)
All Models		
Cylinders	Quantity	3
Firing Order (No. 1 Cylinder on Flywheel Side)	Sequence	1—3—2
Direction	Rotation	Counterclockwise (viewed from flywheel)
Combustion System	Type	Direct Injection
Cooling System (Liquid)	Capacity	5.3 L (Approximate) (5.6 qt.)
Oil (with Filter)	Capacity	4.3 L (Approximate) (4.5 qt.)
Governor	Type	Centrifugal
Idle—Slow	Speed	1000 ± 50 rpm
Idle—High (No Load)	Speed	2775 ± 25 rpm
Rated Speed	Speed	2600 ± 10 rpm
Operating Range	Speed	1000—2810 ± 25 rpm

OUO1023,0002E9F -19-10FEB11-2/2

Repair Specifications

Item	Measurement	Specification
Valve Train:		
Rocker Arm Shaft	OD	15.966—15.984 mm (0.6285—0.6295 in.)
Rocker Arm Shaft Wear Limit	Measurement	15.94 mm (0.6275 in.)
Rocker Arm and Shaft Support Bushing	ID	16.00—16.02 mm (0.630—0.631 in.)
Wear Limit	Measurement	16.09 mm (0.633 in.)
Oil Clearance	Clearance	0.02—0.05 mm (0.001—0.002 in.)
Wear Limit	Measurement	0.15 mm (0.006 in.)
Push Rod Bend	Out of Round	0.0—0.03 mm (0.0—0.001 in.)

Item	Measurement	Specification
Cylinder Head and Valves:		
Cylinder Head Distortion	Measurement	0.0—0.05 mm (0.0—0.002 in.)
Cylinder Head Distortion Wear Limit	Measurement	0.15 mm (0.006 in.)
Intake Valve Seat	Width	1.07—1.24 mm (0.042—0.049 in.)
Intake Valve Seat—Wear Limit	Width	1.74 mm (0.069 in.)
Exhaust Valve Seat	Width	1.24 mm—1.45 mm (0.042—0.049 in.)
Exhaust Valve Seat—Wear Limit	Width	1.94 mm (0.076 in.)
Intake Valve Stem	OD	7.96—7.98 mm (0.313—0.314 in.)
Intake Valve Stem—Wear Limit	OD	7.9 mm (0.311 in.)
Exhaust Valve Stem	OD	7.96—7.97 mm (0.313—0.314 in.)
Exhaust Valve Stem—Wear Limit	OD	7.9 mm (0.311 in.)
Valve Head—Intake Valve	Thickness	1.24—1.44 mm (0.049—0.057 in.)
Valve Head—Exhaust Valve	Thickness	1.35—1.55 mm (0.053—0.061 in.)
Wear Limit	Measurement	0.50 mm (0.020 in.)
Intake Valve	Recess	0.31—0.51 mm (0.012—0.020 in.)

Continued on next page

OUO1023,0002EA0 -19-10FEB11-1/8

Specifications

Item	Measurement	Specification
Intake Valve—Wear Limit	Recess	1.00 mm (0.039 in.)
Exhaust Valve	Recess	0.3—0.5 mm (0.012—0.020 in.)
Exhaust Valve Wear Limit	Measurement	1.00 mm (0.039 in.)
Item	Measurement	Specification
Valve Guide Stem-To-Guide Oil		
Intake	Clearance	0.04—0.07 mm (0.001—0.003 in.)
Exhaust	Measurement	0.05—0.08 mm (0.002—0.003 in.)
Exhaust—Wear Limit	Measurement	0.20 mm (0.008 in.)
Valve Guide	ID	8.01—8.03 mm (0.315—0.316 in.)
Valve Guide—Wear Limit	ID	8.10 mm (0.319 in.)
Valve Guide Projection	Measurement	15 mm (0.591 in.)
Valve Spring Free Length	Length	42.0 mm (1.654 in.)
Maximum Spring Inclination	Measurement	1.10 mm (0.044 in.)
Valve Spring Tension (Measured With Spring Compressed 1.0 mm (0.039 in.))	Tension	2.36—3.10 kg (5.20—6.83 lb.)
Valve Seat Surface—Exhaust Valve	Angle	45°
Intake Valve	Angle	30°
Valve Timing—Intake Valve Opens	Position	10°—20° BTDC
Intake Valve Closes	Position	40°—50° ABDC
Exhaust Valve Opens	Position	51°—61° BBDC
Exhaust Valve Closes	Position	13°—23° ATDC
Piston-to-Cylinder Head Clearance	Clearance	0.66—0.78 mm (0.026—0.031 in.)
Item	Measurement	Specification
Connecting Rod:		
Large End Bearing	ID	51—51.01 mm (2.008—2.008 in.)
Large End Bearing Thickness	Thickness	1.49—1.50 mm (0.059—0.059 in.)
Oversize	Thickness	1.625 mm (0.064 in.)

Continued on next page

OOU1023,0002EA0 -19-10FEB11-2/8

Specifications

Item	Measurement	Specification
Oil Clearance	Clearance	0.02—0.05 mm (0.001—0.002 in.)
Oil Clearance—Wear Limit	Clearance	0.13 mm (0.005 in.)
Connecting Rod Side Play	Play	0.2—0.4 mm (0.008—0.016 in.)

Item	Measurement	Specification
Piston Rings:		
First Compression Piston Ring Groove—3TNV84	Width	2.065—2.08 mm (0.081—0.082 in.)
First Compression Piston Ring Groove—3TNV88	Width	2.06—2.075 mm (0.081—0.082 in.)
First Compression Piston Ring—All	Width	1.97—1.99 mm (0.078—0.078 in.)
First Compression Ring Minimum Side—3TNV84	Clearance	0.075—0.110 mm (0.003—0.004 in.)
First Compression Ring Minimum Side—3TNV88	Clearance	0.070—0.105 mm (0.003—0.004 in.)
Second Compression Piston Ring Groove—3TNV84	Width	2.035—2.05 mm (0.080—0.081 in.)
Second Compression Piston Ring Groove—3TNV88	Width	2.025—2.04 mm (0.080—0.080 in.)
Second Compression Piston Ring Width—All	Width	1.97—1.99 mm (0.078—0.078 in.)
Second Compression Piston Ring Minimum Side—3TNV84	Clearance	0.035—0.07 mm (0.001—0.003 in.)
Second Compression Piston Ring Minimum Side—3TNV88	Clearance	0.045—0.08 mm (0.002—0.003 in.)
Oil Control Piston Ring Groove	Width	4.015—4.03 mm (0.158—0.159 in.)
Oil Control Piston Ring	Width	3.97—3.99 mm (0.156—0.157 in.)
Oil Control Piston Ring Minimum Side	Clearance	0.025—0.06 mm (0.001—0.002 in.)
Piston Ring End	Gap	0.20—0.40 mm (0.008—0.016 in.)
Wear Limit	Measurement	1.50 mm (0.059 in.)

Item	Measurement	Specification
Piston Pin:		
Piston Pin	OD	25.99—26.00 mm (1.023—1.024 in.)
Piston Pin—Wear Limit	OD	25.90 mm (1.020 in.)

Continued on next page

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Specifications

Item	Measurement	Specification
Piston Pin Bushing	ID	23.025—23.038 mm (0.906—0.907 in.)
Piston Pin Bushing—Wear Limit	ID	23.10 mm (0.909 in.)
Piston Pin-To-Rod Bore Oil	Clearance	0.025—0.047 mm (0.001—0.002 in.)
Piston Pin-To-Rod Bore Oil—Wear Limit	Clearance	0.2 mm (0.008 in.)
Piston Pin Bore—In Piston	ID	26.00—26.009 mm (1.023—1.024 in.)
Piston Pin Bore—Wear Limit	ID	26.02 mm (1.024 in.)
Piston Pin-To-Piston Oil	Clearance	0.00—0.022 mm (0.0—0.0009 in.)
Piston Pin-To-Piston Oil—Wear Limit	Clearance	0.12 mm (0.005 in.)

Item	Measurement	Specification
Piston:		
Standard Piston—3TNV84	OD	83.95—83.98 mm (3.305—3.306 in.)
Standard Piston Wear Limit—3TNV84	OD	83.90 mm (3.303 in.)
Standard Piston—3TNV88	OD	87.95—87.98 mm (3.462—3.464 in.)
Standard Piston Wear Limit—3TNV88	OD	87.90 mm (3.461 in.)
Oversize Piston—3TNV84	OD	84.20—84.23 mm (3.315—3.316 in.)
Oversize Piston Wear Limit—3TNV84	OD	84.10 mm (3.311 in.)
Oversize Piston—3TNV88	OD	88.20—88.23 mm (3.472—3.474 in.)
Oversize Piston Wear Limit—3TNV88		88.10 mm (3.469 in.)

Item	Measurement	Specification
Cylinder Bore Inner Diameter:		
Cylinder Bore—3TNV84	ID	84.00—84.03 mm (3.307—3.308 in.)
Cylinder Bore Wear Limit—3TNV84	ID	84.20 mm (3.315 in.)
Cylinder Bore—3TNV88	ID	88.00—88.03 mm (3.465—3.466 in.)
Cylinder Bore Wear Limit—3TNV88	ID	88.20 mm (3.472 in.)

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Specifications

Item	Measurement	Specification
Oversize Bore—3TNV84	ID	84.25—84.28 mm (3.317—3.318 in.)
Oversize Bore—3TNV88	ID	88.25—88.28 mm (3.474—3.476 in.)
Piston-to-Cylinder Clearance		0.040—0.070 mm (0.0016—0.0027 in.)
Cylinder Roundness	Out-of-Round	0.01—0.03 mm (0—0.001 in.)
Cylinder Roundness—Wear Limit	Out-of-Round	0.03 mm (0.001 in.)
Cylinder Taper	Taper	0.00—0.01 mm (0—0.0004 in.)
Cylinder Taper—Wear Limit	Taper	0.03 mm (0.001 in.)
Cylinder—Deglazing	Surface Finish	30—40° crosshatch pattern
Cylinder—Deboring	Surface Finish	30—40° crosshatch pattern

Item	Measurement	Specification
Crankshaft and Main Bearings:		
Connecting Rod Crankshaft Journal	OD	47.95—47.96 mm (1.888—1.888 in.)
Connecting Rod Crankshaft Journal—Wear Limit	OD	47.91 mm (1.886 in.)
Main Bearing Journal	OD	49.952—49.962 mm (1.966—1.967 in.)
Main Bearing Journal—Wear Limit	OD	49.902 mm (1.965 in.)
Main Bearing Oil Clearance	Clearance	0.04—0.07 mm (0.002—0.003 in.)
Main Bearing Oil Clearance—Wear Limit	Clearance	0.16 mm (0.006 in.)
Crankshaft Bend (Maximum)	Bend	0.02 mm (0.001 in.)
Crankshaft	End Play	0.13—0.23 mm (0.005—0.009 in.)

Item	Measurement	Specification
Camshaft:		
Camshaft	End Play	0.05—0.20 mm (0.002—0.008 in.)
Camshaft Bend	Bend	0—0.02 mm (0—0.001 in.)
Camshaft—Wear Limit		0.05 mm (0.002 in.)
Camshaft Side Gap	Gap	0.05—0.25 mm (0.002—0.010 in.)

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OOU1023,0002EA0 -19-10FEB11-5/8

Specifications

Item	Measurement	Specification
Lobe Height—Intake and Exhaust	Height	38.64—38.77 mm (1.521—1.526 in.)
Lobe Height Wear Limit—Intake and Exhaust	Height	38.40 mm (1.512 in.)
Bearing Journal— Flywheel Side and Gear Side	OD	44.93—44.95 mm (1.769—1.770 in.)
Intermediate Journal	OD	44.91—44.94 mm (1.768—1.769)
Intermediate Journal—Wear Limit	OD	44.85 mm (1.766 in.)
Oil Clearance (Gear and Flywheel Ends)	Clearance	0.04—0.13 mm (0.002—0.005 in.)
Oil Clearance—Intermediate	Clearance	0.07—0.12 mm (0.003—0.005 in.)

Item	Measurement	Specification
Camshaft Follower:		
Camshaft Follower Stem	OD	11.98—11.99 mm (0.471—0.472 in.)
Camshaft Follower Stem—Wear Limit		11.93 mm (0.470 in.)
Camshaft Bore	ID	12.00—12.02 mm (0.472—0.473 in.)
Camshaft Bore—Wear Limit		12.05 mm (0.474 in.)
Oil Clearance	Clearance	0.01—0.04 mm (0.0004—0.0016 in.)
Oil Clearance—Wear Limit		0.12 mm (0.005 in.)

Item	Measurement	Specification
Idler Gear:		
Idler Gear Shaft	OD	45.95—45.98 mm (1.809—1.810 in.)
Idler Gear Shaft—Wear Limit	OD	45.93 mm (1.808 in.)
Idler Gear Shaft Bushing	ID	46.00—46.03 mm (1.811—1.812 in.)
Idler Gear Shaft Bushing—Wear Limit	ID	46.08 mm (1.814 in.)
Idler Gear Shaft Bushing	Clearance	0.15 mm (0.006 in.)

Item	Measurement	Specification
Oil Pump:		
Rotor Shaft Outer Diameter to Side Cover Hole Inner Diameter	Clearance	0.01—0.04 mm (0.001—0.002 in.)

Continued on next page

OUO1023,0002EA0 -19-10FEB11-6/8

Specifications

Item	Measurement	Specification
Rotor Shaft Outer Diameter to Side Cover Hole Inner Diameter—Wear Limit	Clearance	0.20 mm (0.08 in.)
Inner Rotor and Outer Rotor-to-Pump Body Side	Clearance	0.03—0.09 mm (0.001—0.004 in.)
Inner Rotor and Outer Rotor-to-Pump Body Side—Wear Limit	Clearance	0.15 mm (0.006 in.)
Outer Rotor-to-Pump Body	Clearance	0.10—0.16 mm (0.004—0.006 in.)
Outer Rotor-to-Pump Body—Wear Limit	Clearance	0.25 mm (0.010 in.)
Inner Rotor to Outer Rotor—Wear Limit	Clearance	0.15 mm (0.006 in.)

Item	Measurement	Specification
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Turbocharger:

Turbocharger	Model	RHB31
Turbine Shaft Journal	OD	6.257—6.263 mm (0.246—0.247 in.)
Turbine Shaft Journal—Wear Limit	OD	6.25 mm (0.246 in.)
Turbine Shaft Seal Ring Groove	Width	1.038—1.062 mm (0.0408—0.0418 in.)
Turbine Shaft Seal Ring Groove—Wear Limit	Width	1.07 mm (0.042 in.)
Compressor Side Seal Ring Groove (G1)	Width	1.02—1.03 mm (0.040—0.041 in.)
Compressor Side Seal Ring Groove (G1)—Wear Limit	Width	1.04 mm (0.041 in.)
Compressor Side Seal Ring Groove (G2)	Width	0.82—0.83 mm (0.246—0.247 in.)
Compressor Side Seal Ring Groove (G2)—Wear Limit	Width	0.84 mm (0.003 in.)
Turbine Shaft	Radial Runout	0.002 mm (0.001 in.)
Turbine Shaft—Wear Limit	Radial Runout	0.005 mm (0.001 in.)
Journal Bearing	ID	6.257—6.285 mm (0.246—0.247 in.)
Journal Bearing—Wear Limit	ID	6.29 mm (0.248 in.)
Journal Bearing	OD	9.940—9.946 mm (0.391—0.392 in.)
Journal Bearing—Wear Limit	OD	9.93 mm (0.391 in.)
Journal Bearing Housing	ID	9.995—10.005 mm (0.394—0.394 in.)

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OUO1023,0002EA0 -19-10FEB11-7/8

Specifications

Item	Measurement	Specification
Journal Bearing Housing—Wear Limit	ID	10.01 mm (0.394 in.)
Thrust Bearing	Width	3.59—3.61 mm (0.141—0.142 in.)
Thrust Bearing—Wear Limit	Width	3.58 mm (0.141 in.)
Thrust Bushing Groove	Width	3.632—3.642 mm (0.143—0.143 in.)
Thrust Bushing Groove (Wear Limit)	Width	3.65 mm (0.144 in.)
Seal Ring Fixing Area (Turbine Side)	Width	11.00—11.018 mm (0.433—0.434 in.)
Seal Ring Fixing Area (Turbine Side)—Wear Limit	Width	11.03 mm (0.434 in.)
Seal Ring Fixing Area (Compressor Side—S1)	Width	9.987—10.025 mm (0.394—0.395 in.)
Seal Ring Fixing Area (Compressor Side—S1)—Wear Limit	Width	10.04 mm (0.395 in.)
Seal Ring Fixing Area (Compressor Side—S2)	Width	7.968—8.00 mm (0.314—0.315 in.)
Seal Ring Fixing Area (Compressor Side—S2)—Wear Limit	Width	8.01 mm (0.314—0.315 in.)

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Tests and Adjustment Specifications

Item	Measurement	Specification
Specifications:		
Valve	Clearance	0.15—0.25 mm (0.006—0.010 in.)
Connecting Rod Side Play	Play	0.2—0.4 mm (0.008—0.016 in.)
Connecting Rod Bearing	Clearance	0.04—0.07 mm (0.002—0.003 in.)
Crankshaft	End Play	0.09—0.27 mm (0.004—0.011 in.)
Crankshaft Main Bearing	Clearance	0.04—0.07 mm (0.001—1.003 in.)
Camshaft	End Play	0.05—0.25 mm (0.002—0.010 in.)
Timing Gear Backlash—All Except Hydraulic Pump Gear	Backlash	0.07—0.15 mm (0.003—0.005 in.)
Hydraulic Pump Gear	Backlash	0.11—0.19 mm (0.004—0.008 in.)
Fuel Injection Nozzle—Opening Pressure	Pressure	19600 + 1000 -0 kPa (196 + 1 -0 bar) (2843 + 145 -0 psi)
Leakage at 11 032 kPa (110 bar) (1600 psi)	Leakage	None for a minimum of 10 seconds
Chatter and Spray Pattern at 19 600 ± 1000 kPa (196 bar) (2843 ± 145 psi)—Slow Hand Lever Movement	Pressure	Fine Stream; Chatter Sound
Chatter and Spray Pattern at 19 600 ± 1000 kPa (196 bar) (2843 ± 145 psi)—Fast Hand Lever Movement	Pressure	Fine Atomized Spray; 150° Spray Pattern
Alternator Drive Belt Deflection	Deflection	10—15 mm (0.4—0.6 in.)
Fuel Injection Pump Timing	Position	11° ± 1° BTDC
Turbocharger Rotor Play in Axial Direction	Play	0.022—0.053 mm (0.001—0.002 in.)
Turbocharger Rotor Play in Axial Direction—Wear Limit	Play	0.07 mm (0.007 in.)
Turbocharger Rotor Play in Radial Direction	Play	0.061—0.093 mm (0.002—0.004 in.)
Turbocharger Rotor Play in Radial Direction—Wear Limit	Play	0.12 mm (0.005 in.)

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Operational Tests

Item	Measurement	Specification
Operational Tests		
Cooling System—Test	Pressure	88 ± 15 kPa (0.88 ± 0.15 bar) (12.8 ± 2.2 psi)
Thermostat Temperature—Opening	Temperature	107—113 °C (224—235 °F)
Minimum Lift Height above 85 °C (185 °F)	Height	8.0 mm (0.135 in.)
Radiator Cap—Opening	Pressure	88 ± 15 kPa (0.88 ± 0.15 bar) (12.8 ± 2.2 psi)
Cylinder Compression—3TNV84 (@ 250 rpm)	Pressure	3240 ± 100 kPa (32.4 ± 1 bar) (469 ± 14.5 psi)
Cylinder Compression—3TNV84 (@250 rpm (minimum))	Pressure	2550 ± 100 kPa (25.5 ± 1 bar) (369 ± 14.5 psi)
Cylinder Compression—3TNV84T (@ 250 rpm)	Pressure	2940 ± 100 kPa (29.4 ± (bar) (426 ± 14.5 psi)
Cylinder Compression—3TNV84T (@250 rpm (minimum))	Pressure	2450 ± 100 kPa (24.5 ± 1.0 bar) (355 ± 14.5 psi)
Cylinder Compression—3TNV88 (@ 250 rpm)	Pressure	3430 ± 100 kPa (34.3 ± 1.0 bar) (497 ± 14.5 psi)
Cylinder Compression—3TNV88 (@250 rpm (minimum))	Pressure	2750 ± 100 kPa (27.5 ± 1.0 bar) (399 ± 14.5 psi)
Cylinder Compression—Difference Between Cylinders	Pressure	200—300 kPa (2—3 bar) (29—43 psi)
Oil Pressure—Rated Speed		294—392 kPa (2.94—3.92 bar) (42.6—56.8 psi)
Oil Pressure—Slow Idle (Minimum)	Pressure	58.8 kPa (0.59 bar) (8.5 psi)
Oil Relief Valve—Opening	Pressure	294—392 kPa (2.94—3.92 bar) (43—57 psi)
Oil Pressure Switch—Opening	Pressure	49 ± 9.8 kPa (0.49 ± 0.098 bar) (7.1 ± 1.4 psi)

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Torque Values, Non-Standard Fasteners

Item	Measurement	Specification
Torque Specifications:		
Cylinder Head Bolts (Lubricating Oil Applied)	Torque	85—91 N·m (63—67 lb.-ft.)
Connecting Rod Bolts (Lubricating Oil Applied)	Torque	44—54 N·m (33—40 lb.-ft.)
Damper Cap Screws	Torque	48—50 N·m 35—37 lb.-ft.
Flywheel Mounting Bolts (Lubricating Oil Applied)	Torque	83—88 N·m (62—65 lb.-ft.)
Main Bearing Bolts (Lubricating Oil Applied)	Torque	96—100 N·m (71—74 lb.-ft.)
Crankshaft Pulley Bolt (Lubricating Oil Applied)	Torque	113—122 N·m (83—90 lb.-ft.)
Fuel Injector Nozzle Nut	Torque	6.8—8.8 N·m (60—78 lb.-in.)
Governor Weight Support Nut	Torque	44—49 N·m (33—36 lb.-ft.)
Rocker Arm Mounting Cap Screw and Nut	Torque	26 N·m (19 lb.-ft.)
Oil Pump Mounting Cap Screw	Torque	25 N·m (18 lb.-ft.)
Starting Motor Mounting Bolts	Torque	47 N·m (35 lb.-ft.)
Turbocharger Waste Gate Actuator Set Bolt	Torque	3.9—4.9 N·m (34.5—43.4 lb.-in.)
Turbocharger Blower Impeller Set Nut (Left-Hand Thread)	Torque	0.9—1.19 N·m (8.0—10.5 lb.-in.)
Lock Plate Set Bolt	Torque	11.8—12.8 N·m (104.4—113.3 lb.-in.)
Thrust Bearing Set Screw	Torque	1.2—1.4 N·m (10.6—12.4 lb.-in.)
Seal Plate Set Screw	Torque	1.2—1.4 N·m (10.6—12.4 lb.-in.)
Glow Plug (if equipped)	Torque	15—20 N·m 133—177 lb.-ft.
Glow Plug Connector Nut	Torque	1—1.5 N·m 9—13 lb.-in.

OUO1023,0002EA3 -19-10FEB11-1/1

Special Tools

NOTE: Order tools according to information given in the U.S. SERVICE-GARD™ Catalog or in the European Microfiche Tool Catalog (MTC).

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OUO1023,0002EA4 -19-10FEB11-1/18

Specifications

Dial Indicator.....(English, in.) Use with JDG451 to measure valve recess.
D17526CI or (Metric, mm) D17527CI

OUO1023,0002EA4 -19-10FEB11-2/18

Spring Compression Tester D01168AA Test valve spring compression.

OUO1023,0002EA4 -19-10FEB11-3/18

Valve Inspection Center..... D05058ST Check valves for out-of-round.

OUO1023,0002EA4 -19-10FEB11-4/18

End Brush..... D17024BR Clean valve seat and bores.

OUO1023,0002EA4 -19-10FEB11-5/18

Compression Test Adapter JDG1687 To check cylinder compression pressure on diesel engines

OUO1023,0002EA4 -19-10FEB11-6/18

Universal Pressure Test KitJT05470 Used to check engine oil pressure.
(D15027NU or FKM10002)

OUO1023,0002EA4 -19-10FEB11-7/18

Cooling System Pressure Pump..... D05104ST Used to pressure test radiator cap and cooling system.

OUO1023,0002EA4 -19-10FEB11-8/18

Magnetic Follower Holder Kit.....D15001NU Hold cam followers when removing and installing camshaft.

OUO1023,0002EA4 -19-10FEB11-9/18

Nozzle Cleaning KitJDF13 Use to clean fuel injection nozzles.

OUO1023,0002EA4 -19-10FEB11-10/18

Valve Guide Knurler Kit JT05949 or D-20019WI Knurl valve guides.

OUO1023,0002EA4 -19-10FEB11-11/18

Valve Guide Driver..... JDE118 Use to remove and install valve guides in cylinder head.

OUO1023,0002EA4 -19-10FEB11-12/18

Valve Guide Reamer D-20021WI Use to ream out valve guides.

Continued on next page

OUO1023,0002EA4 -19-10FEB11-13/18

Specifications

Turbocharger Shield JDG576

Cover turbocharger inlet when testing engine with air filter system removed.

OUO1023,0002EA4 -19-10FEB11-14/18

Manifold Pressure Tester.....JDE147 or FKM10002

Used to test intake manifold pressure on turbocharged engines.

OUO1023,0002EA4 -19-10FEB11-15/18

Air Regulator with Gauge

Pressurize wastegate actuator to test operation of wastegate.

OUO1023,0002EA4 -19-10FEB11-16/18

Pressure Gauge, 0—200 kPa (0—2 bar) (0—30 psi),
Hose and Fittings.....JT05470

JT05470 Universal Pressure Test Kit or any other suitable equipment.

Measure transfer pump pressure in rotary injection pump systems. Assemble test equipment from

OUO1023,0002EA4 -19-10FEB11-17/18

Non—contact Temperature Measuring GunJT07254

Spots heat problems early in your electrical and mechanical systems.

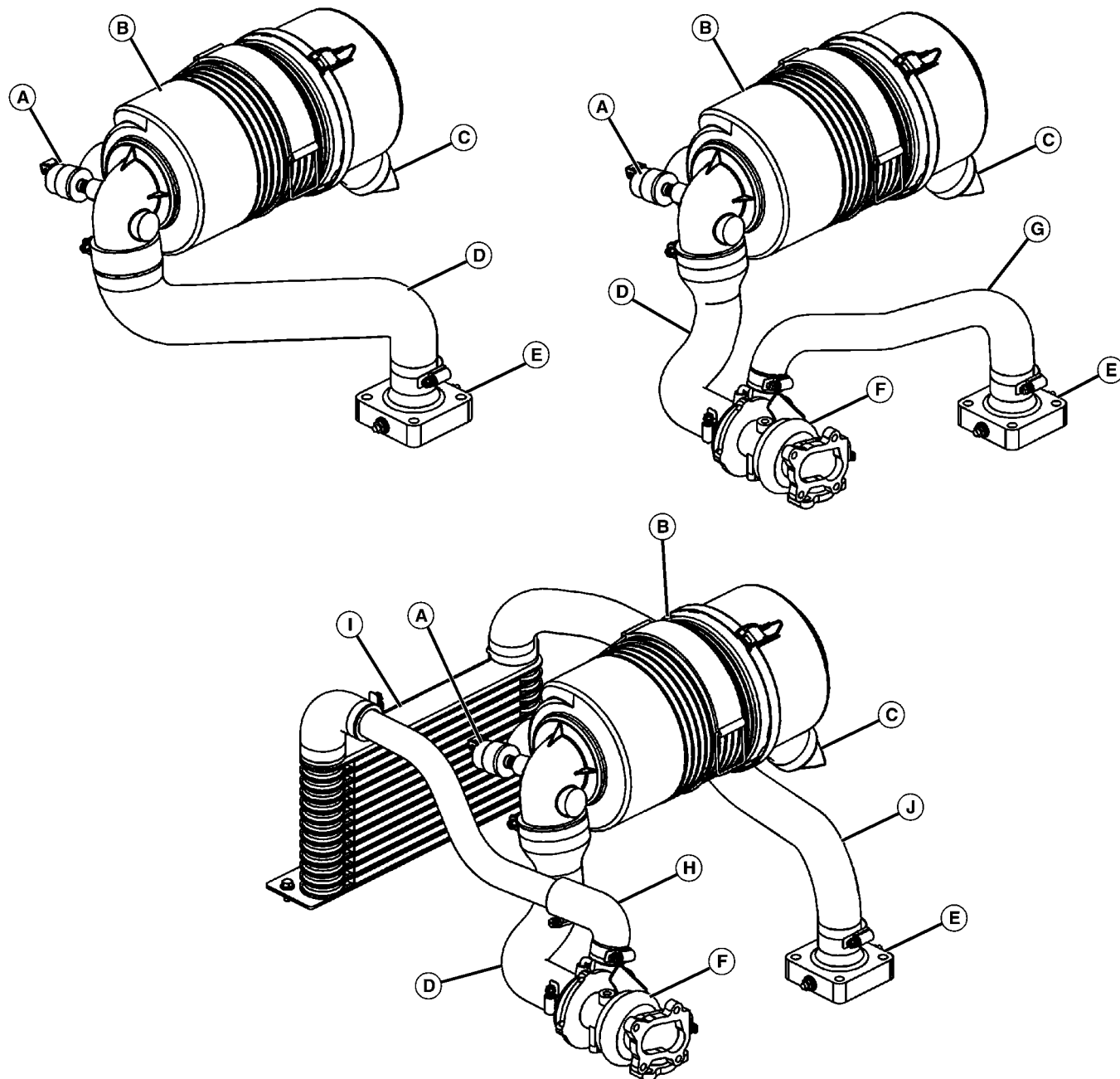
OUO1023,0002EA4 -19-10FEB11-18/18

Other Materials

Number	Name	Use
	Brake clean or Ignition Cleaner	Remove sealant from crankshaft flange.
	Plastigage	Check main bearing-to-crankshaft journal oil clearance.
TY15130 LOCTITE® (U.S.)	John Deere Form-In-Place Gasket	Seals rear oil seal case and flywheel housing to engine block. Seals oil pan to timing gear housing and engine block.
TY9370 LOCTITE® No. 242 (U.S.)	Thread Lock and Sealer (Medium Strength)	Apply to threads of crankshaft pulley cap screw.
AR44402 (U.S.)	Valve Stem Lubricant	Lubricate valve stems.
PT569 (U.S.)	NEVER-SEEZ™ Compound	Turbocharger-to-exhaust manifold cap screws.

OUO1023,0002EA5 -19-10FEB11-1/1

Air Cleaner and Intake Components



Turbocharger and Air Cooler are optional components

A—Air Restriction Sensor
B—Air Cleaner Assembly
C—Dust Unloading Valve

D—Air Intake Hose
E—Manifold Air Heater (if equipped)
F—Turbocharger

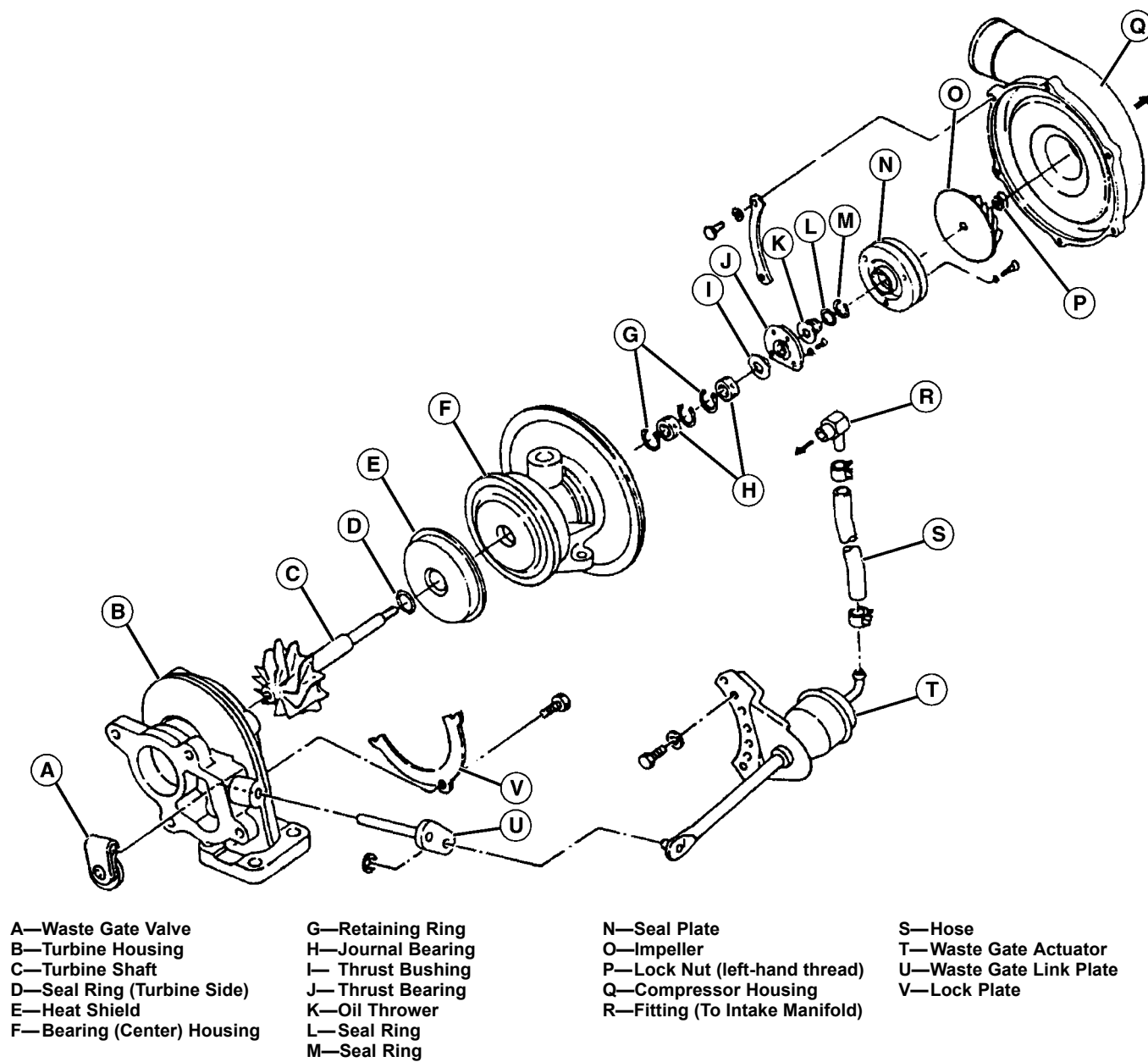
G—Turbo-to-Manifold Hose
H—Turbo-to-Air Cooler Hose
I—Air Cooler

J—Air Cooler-to-Manifold Hose

LVAL13727 —UN—18NOV10

OUO1023,0002EA6 -19-10FEB11-1/1

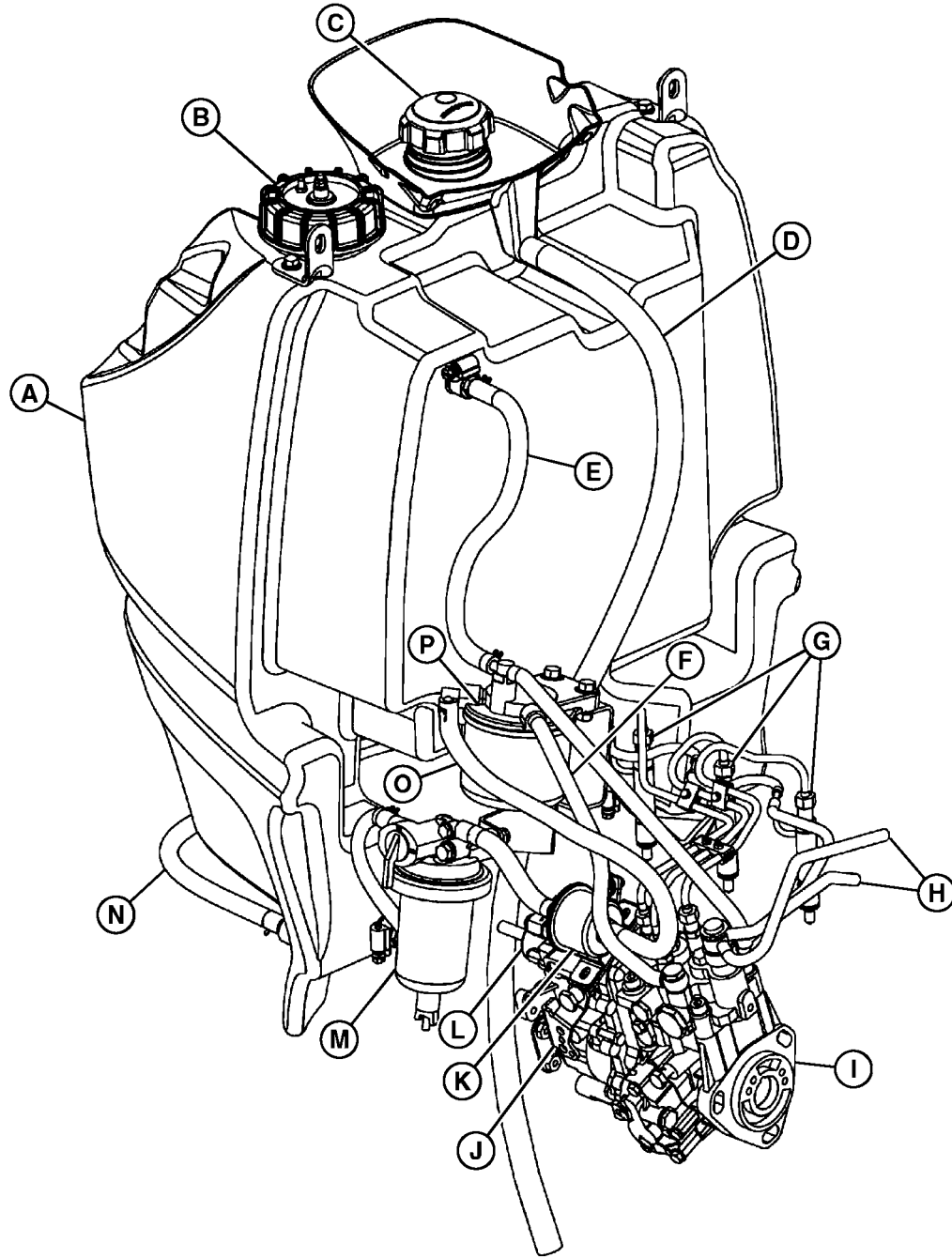
Turbocharge Components



LVAL13728—UN—18NOV10

OUC1023,0002EA7 -19-10FEB11-1/1

Fuel Supply Components



A—Fuel Tank
B—Fuel Level Sensor
C—Fuel Filler Cap
D—Overflow Drain Hose
E—Fuel Bleed-off Return Hose

F—Fuel Filter-to-Injector Pump
Hose
G—Injector Nozzles
H—Cold Start Advance Hoses to
the Water Pump

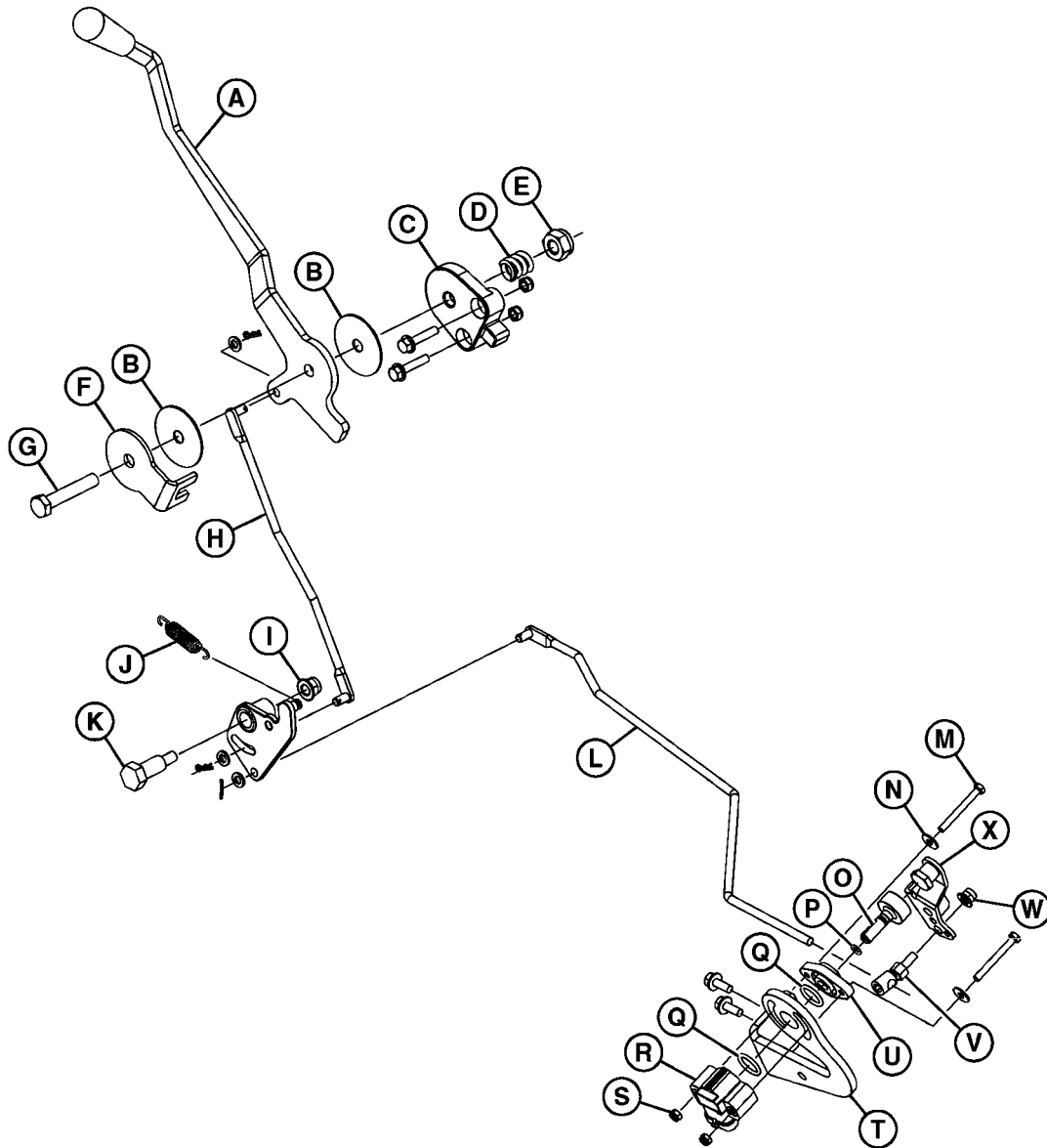
I—Injector Pump
J—Throttle Lever
K—Fuel Transfer Pump
L—Fuel Shutoff Solenoid
M—Water Separator

N—Fuel Tank Crossover Hose
O—Transfer Pump-to-Filter Hose
P—Fuel Filter

OUO1023,0002EA8 -19-10FEB11-1/1

LVAL13893 —UN—10JAN11

Engine Throttle Components



A—Throttle Handle
B—Washer, Friction (2 used)
C—Spacer
D—Compression Spring
E—Lock nut
F—Plate, Handle Tension

G—Bolt
H—Rod, Upper Throttle
I—Lock Nut
J—Extension Spring
K—Bolt
L—Rod, Lower Throttle
M—Cap Screw, M5 x 45 (2 used)

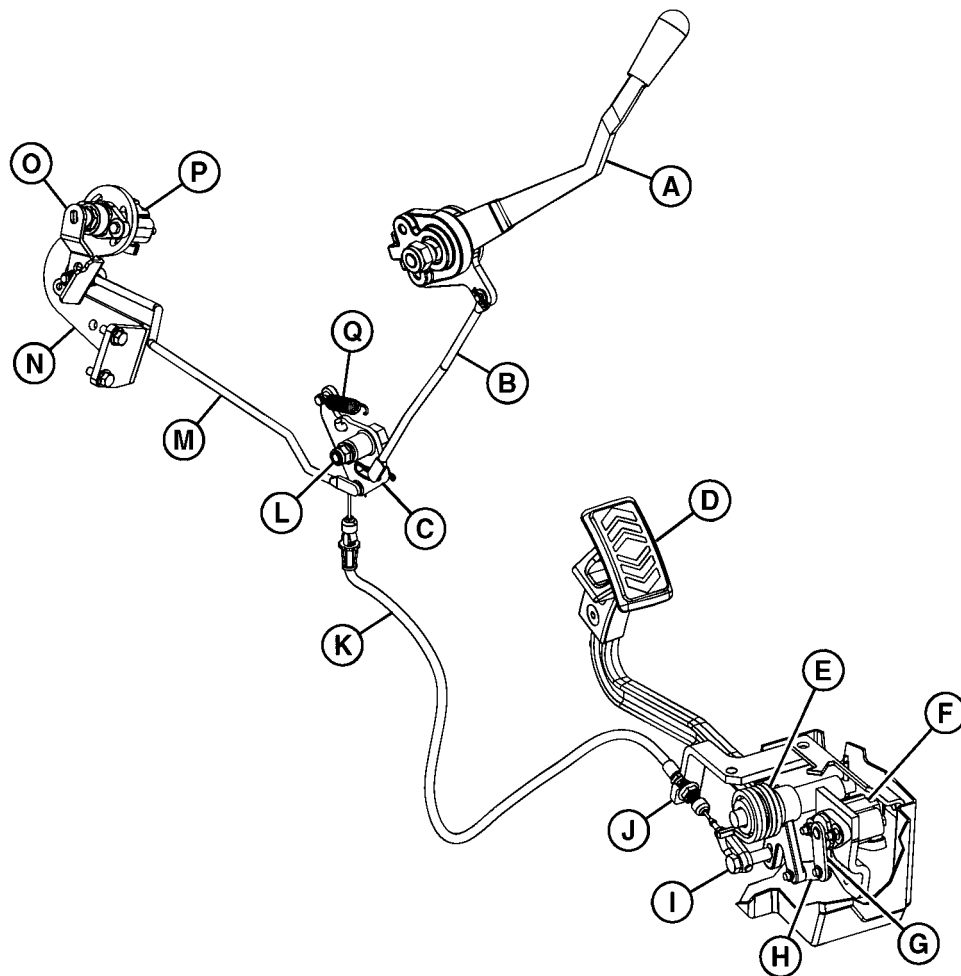
N—Washer (2 used)
O—Adaptor Fitting
P—O-Ring
Q—O-Ring (2 used)
R—Sensor, Throttle
S—Lock Nut (2 used)
T—Bracket, Throttle Sensor

U—Support, Throttle Sensor
V—Swivel
W—Lock Nut
X—Throttle Lever

OUO1023,0002EA9 -19-10FEB11-1/1

LVAL13894 —UN—10JAN11

Throttle Components—AutoHST



A—Throttle Lever
B—Upper Throttle Rod
C—Bellcrank
D—Pedal, Forward/Reverse¹

E—Torsion Spring
F—Position Sensor
G—Rotary Arm
H—Link
I—Bolt
J—Adjustment Nut
K—Cable Assembly

L—Bolt
M—Lower Throttle Rod
N—Throttle Sensor Bracket
O—Bellcrank
P—Throttle Sensor

Q—Extension Spring

¹See AutoHST components in Power Train - Hydrostatic section

OUC1023,0002EAA -19-10FEB11-1/1

LVAL13895 —UN—10JAN11

Fuel System Operation

Function:

Fuel system supplies fuel to the injection nozzles.

The air intake system filters and supplies air for combustion.

Theory of Operation:

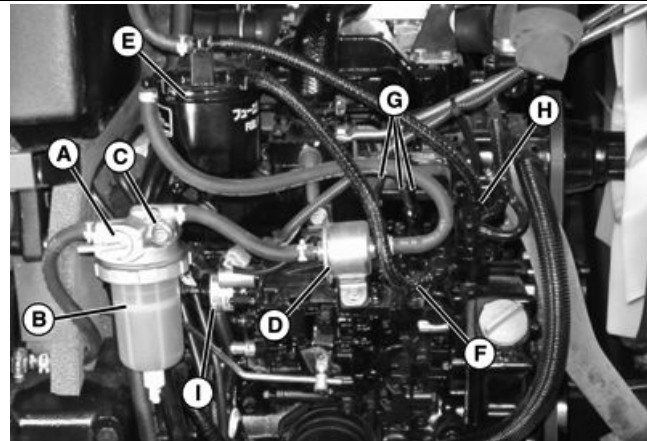
Fuel System:

Fuel from the fuel tank flows to the fuel shutoff valve (A) in the top of the fuel strainer/water separator (B). An air bleed screw (C) in the top of the housing is used for bleeding air out of the fuel strainer/water separator when tractor has run out of fuel or fuel filters are serviced. An electric fuel transfer pump (D) pumps low-pressure fuel to the secondary fuel filter (E) and then to the fuel injection pump inlet (F). The injection pump then directs high-pressure fuel through the injector lines (G) to the fuel injector nozzles for combustion. Excess fuel from the injection pump is combined with leak off fuel from the injectors, through a junction fitting (H) and is routed through the top of the secondary filter base, back to the fuel tank.

If the machine runs out of fuel, or after servicing fuel strainer/water separator, air must be bled from the fuel strainer/water separator. Make sure that fuel shutoff valve is ON. Open bleed screw (C) two or three turns and observe bleed screw. When a steady stream of fuel with no bubbles is observed close bleed screw. Turn the key switch ON. Let the electric fuel transfer pump run (you should hear clicking sound) for 30 seconds to purge the air from the fuel system.

The engine speed is controlled by the throttle lever and rod or the foot accelerator. The rod is connected to the injection pump governor control lever. The fuel shutoff solenoid (I) controls the injection pump shutoff shaft. When the solenoid is retracted (key in the START or ON position), the engine can be started. When the key is turned off, return springs on the shutoff shaft, extend the solenoid, moving the shutoff linkage to the shutoff position. The solenoid also closes if the machine is operated in an unsafe condition.

For more information see the following:



Open station model shown.

- | | |
|-----------------------------------|----------------------------|
| A—Fuel Shutoff Valve | F—Fuel Injector Pump Inlet |
| B—Fuel Strainer – Water Separator | G—Injector Lines |
| C—Air Bleed Screw | H—Junction Fitting |
| D—Fuel Transfer Pump | I—Fuel Shutoff Solenoid |
| E—Secondary Fuel Filter | |

- For North American Machines, see [Fuel Supply/Engine Shutoff Circuit Operation \(NA.\)](#)
- For European machines, see [Fuel Supply/Engine Shutoff Circuit Operation.](#)

The injection pump meters fuel as determined by the governor and delivers it at high pressure to the injection nozzles.

The injection nozzle prevents flow until high pressure is reached, then opening the valve and spraying atomized fuel into the combustion chamber. Injection lines contain trapped fuel whenever injection is not taking place.

A small amount of fuel leaks past the nozzle valve to lubricate the fuel injection nozzle. This leakage combines with excess fuel from the injection pump and is returned to tank. Any air in the fuel system is bled out with return fuel to the fuel tank.

A fuel level sensor mounted in the fuel tank informs the operator of the fuel level.

LVAL13729 —UN—18NOV10

OUO1023,0002EAB -19-18DEC12-1/1

Cooling System Operation

Function:

The coolant pump circulates the coolant through the cooling system, drawing hot coolant from the engine block, circulating it through the radiator to cool.

Theory of Operation:

The pressurized cooling system includes the radiator, water pump, fan, and thermostat.

During warm-up the thermostat remains closed and the impeller type coolant pump draws coolant from the bypass tube. Coolant from the pump flows to the cylinder block water jacket and up through the cylinder head providing a fast warm-up.

Once the engine has reached operating temperature, the thermostat opens and coolant is pumped from the bottom of the radiator via the lower radiator hose into the cylinder block. Here it circulates through the block and around the cylinders.

From the block, coolant is then directed through the cylinder head, and into thermostat housing. With the thermostat open; warm engine coolant passes through the housing into the top of the radiator where it is circulated to dissipate heat.

Specification

Cooling System
Thermostat—Start to
Open—Temperature..... 69.5—72.5 °C
(157—163 °F)

Cooling System
Thermostat—Fully
Open—Temperature..... 85 °C
(185 °F)

When coolant system pressure exceeds **48 kPa (7 psi)**, a valve in the radiator cap opens to allow coolant to discharge into the coolant recovery tank.

When temperature is reduced, a vacuum is produced in the radiator and coolant is drawn back out of the coolant recovery tank through a valve in the radiator cap.

A coolant temperature sensor informs the operator of the engine coolant temperature and warns of overheating by lighting a lamp.

On the TNV engines there are small coolant lines between the water pump and the cold start advance unit on the fuel injection pump. The water pump circulates engine block coolant through the fuel injection pump. While the engine is cold, the fuel injection pump timing is advanced from normal operation which aids in cold starting. When warm water circulates through the fuel injection pump the timing is retarded to provide a cleaner burning of fuel.

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Air Intake System

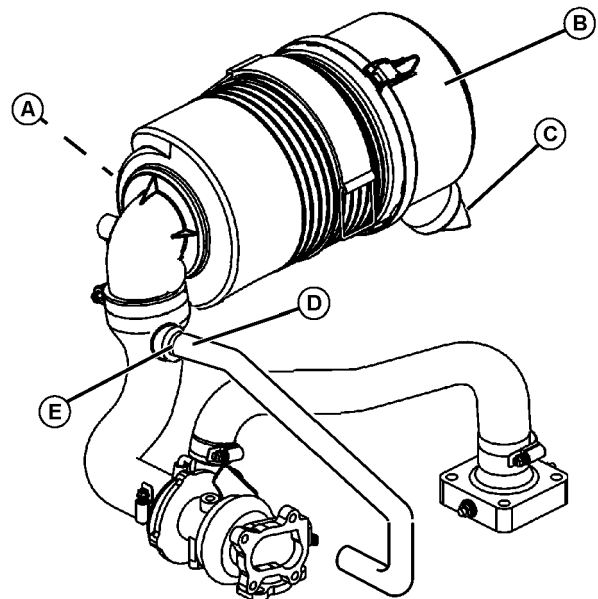
Function:

To supply clean air to the engine for combustion. New Closed Crankcase Ventilation system is routed to intake system to burn crankcase gasses, reducing engine emissions.

Theory of Operation:

Air enters the air cleaner inlet tube above the radiator (A) and is directed into the air cleaner housing. The air is directed to a baffle which starts a high-speed centrifugal motion of air which continues around the element until it reaches the far end of the air cleaner housing (B).

Most of the dust is separated from the air by centrifugal force that causes heavy dust particles to enter the opening at the top of the unloader valve (C). The air flows through the primary air filter element. The primary filter element filters the larger dirt particles before the air enters the secondary air filter element. The finer dirt particles are filtered out by the secondary air filter before the air enters the intake manifold.



A—Inlet Tube
B—Housing
C—Unloader Valve

D—Crankcase Vent Hose
E—Restrictor Fitting

LVAL13896 —UN—14JAN11

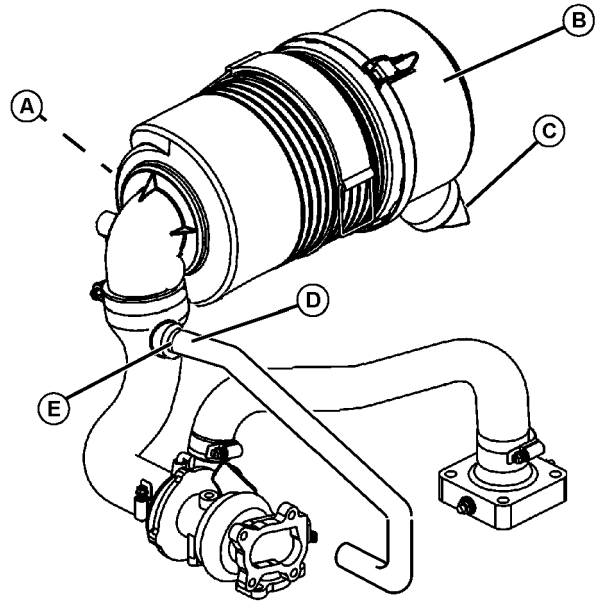
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OUO1023,0002EAD -19-10FEB11-1/2

A restrictor fitting (E) connects the crankcase vent hose (D) and the rubber elbow (F) between the air cleaner and turbo inlet. This is a directional fitting and must be installed with arrows and/or the small hole in the end toward the air inlet to the turbo. The dirt that is deposited in the unloader valve is removed through the rubber diaphragm at the base of the air cleaner. When the engine is running, a pulsing action is created in the intake system by each intake stroke of the engine. This pulsing action causes the rubber diaphragm to open and close, thus emptying the unloader valve. The operator can squeeze the valve to let the large particles out.

E—Restrictor Fitting

F—Rubber Elbow



LVAL13896 —UN—14JAN11

OUO1023,0002EAD -19-10FEB11-2/2

Turbocharger Operation

Function:

The turbocharger supplies pressurized air to the air intake manifold of the engine.

Theory of Operation:

Exhaust gas (F) from the engine is blown onto the turbine impeller (A) in the turbocharger turbine housing to rotate the turbine shaft (B). The turbine impeller and shaft are referred to as the turbine.

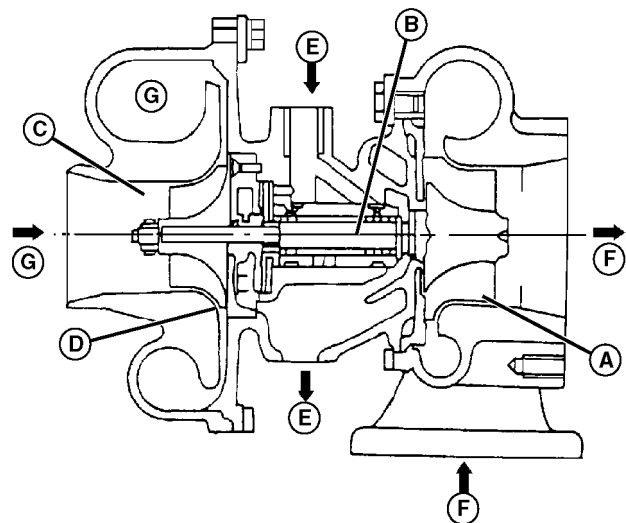
The compressor impeller (C) installed on the turbine shaft rotates with the shaft to draw in filtered air (G) and discharge the compressed air into the intake manifold, where it is then delivered to the engine combustion chambers. The compressor impeller and housing are referred to as the blower or compressor.

To prevent the intake air and oil from leaking, a seal ring and a seal plate (D) are provided to form a double wall structure on the rear side of the compressor impeller.

A waste gate assembly is installed on the turbocharger to prevent it from overspeeding and maintain constant manifold intake pressure. When the blower side pressure (intake pressure) exceeds a specified level, the exhaust gas at the turbine inlet is partially bypassed to the discharge side to control the turbine rpm. This improves response to load variations in the low to medium speed range and minimizes black exhaust smoke.

The waste gate consists of a control assembly separated from the turbocharger and a valve assembly installed in the turbine impeller chamber.

Engine oil (E), under pressure from the engine lubricating system, is provided to the turbocharger center housing to lubricate and cool the shaft and bearings.



A—Turbine Impeller
B—Turbine Shaft
C—Compressor Impeller
D—Seal Plate

E—Engine Oil
F—Exhaust Gas
G—Air

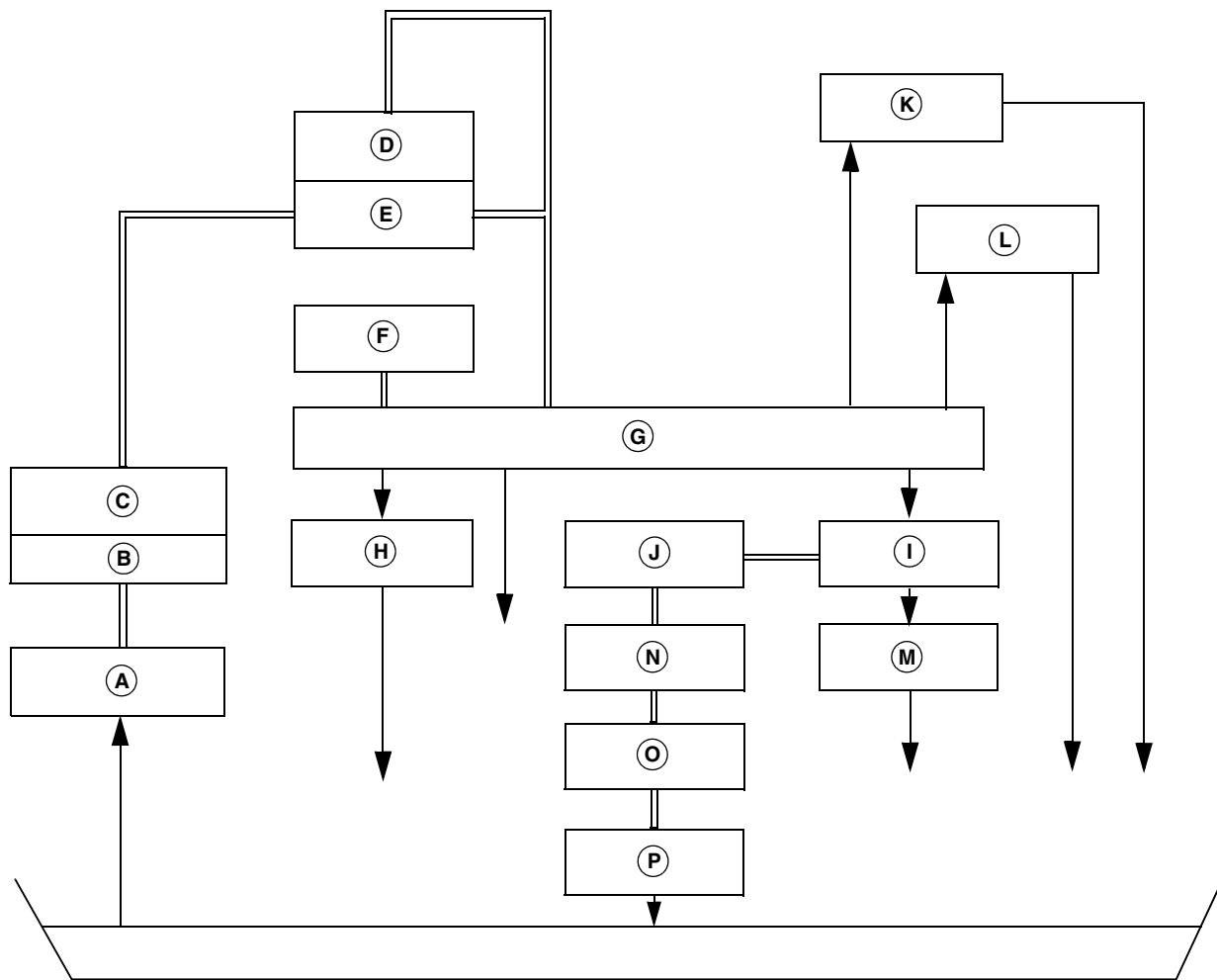
Engine oil, under pressure from the lubricating system, is pumped through a passage in the bearing housing and directed to the bearings, thrust plate, and thrust sleeve. Oil is sealed from the compressor and turbine at both ends of the bearing (center) housing.

Engine oil then drains through the bottom of the center housing, through a tube and hose, into the back of the timing gear housing and returns to crankcase.

LVAL13730 —UN—18NOV10

OUO1023,0002EAE -19-10FEB11-1/1

Lubrication System Operation



A—Oil Suction Pipe (Strainer)
 B—Oil Pump
 C—Regulator Valve
 D—Oil Filter
 E—Bypass Valve

F—Pressure Switch
 G—Engine Block Main Oil Gallery
 H—Intermediate Gear Shaft
 I—Crank Journal

J—Camshaft Bearing
 K—Turbocharger Housing
 L—Fuel Injection Pump
 M—Crank Pin
 N—Rocker Arm Bearings

O—Rocker Arm
 P—Tappet Cam Face

Function:

A full pressure system lubricates engine parts with filtered oil.

Theory of Operation:

The pressure lubrication system consists of an oil strainer (A), positive displacement oil pump (B), oil pressure regulating valve (C), full flow oil filter (D), oil pressure regulating valve (C) and an electrical pressure warning switch (F).

The pump draws lubrication oil from the oil pan through a strainer and a suction tube. The oil is then pumped through an oil passage to the oil filter and through the engine block main oil gallery (G).

From the main oil gallery, oil is forwarded under pressure to the intermediate gear shaft (H) and crankshaft main bearing journals (I). Drilled cross-passages in the crankshaft distribute the oil from the main bearings to connecting rod bearings.

Lube oil holes in main bearing oil grooves direct oil to the camshaft bearings (J).

A drilled passage from the rear camshaft bearing through the cylinder block and cylinder head supplies lubricating oil to the rocker arm bearings. The hollow shaft distributes oil to the rocker arms, cam followers, and valves.

Lubrication oil is supplied to the fuel injection pump (J) and turbocharger bearing housing (K) from the main oil gallery through external oil lines.

Continued on next page

OUO1023,0002EAF -19-10FEB11-1/2

LVAL13731—UN—18NOV10


Theory of Operation

An oil pressure switch (F) activates an indicator light to alert the operator if oil pressure drops below specification.

OUO1023,0002EAF -19-10FEB11-2/2

Engine Troubleshooting

 **CAUTION: Avoid Injury!** Engine radiator fluid is hot during operation.

 **CAUTION: Avoid Injury!** The engine may start to rotate at any time. Keep hands away from all moving parts when testing.

OUO1023,0002EB0 -19-10FEB11-1/1

Engine Oil Diagnostics

Symptom	Problem	Solution
Crankcase Contamination	Fuel in crankcase.	Broken or seized piston ring—replace rings and check cylinder. Seized intake/exhaust valve—replace valve and check valve guide. Piston ring, piston, or cylinder worn—bore or hone cylinder and replace piston.
	Water in crankcase.	Leaking cylinder head gasket—replace head gasket. Cracked water jacket—repair or replace water jacket.
Symptom	Problem	Solution
Low Oil Pressure	Oil level low.	Add oil.
	Oil filter clogged.	Replace Oil Filter.
	Incorrect viscosity	Check oil for too low viscosity, or coolant-or-fuel-diluted engine oil. Change engine oil.
	External oil leaks	Repair as necessary
	Oil pressure relief valve worn.	Clean, adjust, or replace relief valve.
	Oil pump defective.	Remove and inspect oil pump. (See <u>Oil Pump (Engines 3TNV8x-BJT, -BMJT, -BXJT)</u> in Section 30, Group 30.)
	Coolant in oil.	(See <u>Coolant in Oil or Oil in Coolant</u> in Section 20, Group 20.)
	Fuel in oil.	Broken or seized piston ring. Replace rings and check cylinder. Seized intake or exhaust valve. Check valve guides and stems. Piston ring, piston, or cylinder worn. Bore or hone cylinder and replace piston.

Continued on next page

OUO1023,0002EB1 -19-18DEC12-1/2

Symptom	Problem	Solution
	Oil pump screen clogged or pick-up tube cracked.	Remove oil pan and clean screen. Replace pick-up tube. (See Oil Pan and Crankcase Housing Extension to remove Oil Pan and Strainer.)
	Intake/Exhaust valves worn.	Check valve guides and stems.
	Crankshaft pin or bearing worn.	Reground crank and replace bearings.
	Connecting rod bolt loose.	Check for damage and torque bolts.
	Excessive volume of fuel injected.	Check fuel injection pump and injectors.
	Broken or seized piston ring.	Replace rings and check cylinder.
	Excessive main or connecting rod bearing clearance.	Determine bearing clearance. (See Connecting Rod Bearing Clearance Check in Section 30, Group 25.)
	Piston ring, piston, or cylinder worn.	Bore or hone cylinder and replace piston.
	Piston ring end gaps not correct.	Stagger piston ring gaps.
	Piston rings installed incorrectly.	Install piston rings correctly.
	Excessive fumes or dripping oil; appears to be caused by turbocharger boost pressure.	Check the turbocharger, repair/replace as needed. (See Turbocharger Failure Analysis in Section 20, Group 20.)
	Excessive fumes or dripping oil observed; does not appear to be caused by turbocharger boost pressure.	Excessive blow-by, not caused by boost pressure is most likely caused by faulty piston rings/cylinder bores not providing an adequate combustion seal. Perform a compression test to verify this is the case. (See Cylinder Compression Test in Section 30, Group 25.)
	Check for turbocharger oil seal leaks. Signs of oil leakage present.	Investigate problems associated with oil leakage as outlined in the test procedure, perform necessary repairs, and retest. (See Turbocharger Oil Seal Leak Check in Section 30, Group 25.)

OUO1023,0002EB1 -19-18DEC12-2/2

Symptom	Problem	Solution
High Oil Pressure	High Oil Pressure	<p>Improper engine oil viscosity/type—replace engine oil and filter.</p> <p>Oil pressure relief valve failed. Inspect oil pressure relief valve. (See <u>Oil Pump (Engines 3TNV8x-BJT, -BMJT, -BXJT)</u> in Section 30, Group 30.)</p>

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Excessive Fuel Consumption

Symptom	Problem	Solution
Excessive Fuel Consumption	Compression leakage from valve seat.	Grind valve seat; regrind valves.
	Engine running too cool.	Check thermostat.
	Excessive volume of fuel injected.	Check fuel injection pump and injectors.
	Poor fuel injection pattern.	Clean or replace fuel injector nozzles.

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Incorrect Manifold Pressure

Symptom	Problem	Solution
Low Manifold Pressure	Improper intake or exhaust valve clearance.	Adjust valve clearance.
	Compression leakage from valve seat	Grind valve seat; regrind valves.
	Seized intake/exhaust valve.	Replace valve and check valve guide.
	Clogged air filter.	Clean or replace air filter.
	Engine at high altitude/temperature.	Use higher output engine.
High Manifold Pressure	Excessive volume of fuel injected.	Check fuel injection pump and injectors.

OUO1023,0002EB3 -19-10FEB11-1/1

Low Engine Compression

Symptom	Problem	Solution
Low Engine Compression	Oil filter clogged.	Replace oil filter.
	Improper engine oil viscosity/type.	Replace engine oil and filter.
	Excessive volume of fuel injected.	Check fuel injection pump and injectors.
	Compression leakage from valve seat.	Grind valve seat; regrind valves.
	Seized intake/exhaust valve.	Replace valve and check valve guide.
	Broken or seized piston ring.	Replace rings and check cylinder.
	Piston ring, piston, or cylinder worn.	Bore or hone cylinder and replace piston.
	Crankshaft pin or bearing seized.	Regrind crank and replace bearings.
	Piston ring end gaps not correct.	Stagger piston ring gaps.
	Piston rings installed incorrectly.	Install piston rings correctly.
	Foreign matter in combustion chamber.	Remove head and inspect for damage.
	Intake/Exhaust valves worn.	Check valve guides and stems.

OUO1023,0002EB4 -19-10FEB11-1/1

Engine Starting Problem

Symptom	Problem	Solution
Engine Does Not Start	Battery voltage low.	Recharge battery.
	Starting motor defective.	Repair or replace starting motor.
	Alternator defective.	Repair or replace alternator.
	Open circuit in wiring.	Repair wiring.
	Faulty fuel shutoff solenoid circuit or fuel shutoff solenoid.	Test electrical circuit, replace fuel shutoff solenoid.
	Fuel filter clogged.	Replace fuel filter.
	Clogged or cracked fuel lines.	Clean or replace fuel lines.
	Fuel volume to injection pump low.	Check or replace fuel transfer pump.
	Water in fuel.	Check and repair.
	Improper intake or exhaust valve clearance.	Adjust valve clearance.
	Improper timing between injection pump, intake, and exhaust valves.	Adjust valve clearance. Check valve timing.
	Seized intake/exhaust valve.	Replace valve and check valve guide.
	Broken or seized piston ring.	Replace rings and check cylinder.
	Piston ring, piston, or cylinder worn.	Bore or hone cylinder and replace piston.
	Crankshaft pin or bearing seized.	Reground crank and replace bearings.
	Air entering fuel system.	Check and repair fuel supply system.
Symptom	Problem	Solution
Engine Starts But Does Not Continue Running—Exhaust Smoke Absent	Fuel filter clogged.	Replace fuel filter.
	Clogged or cracked fuel lines.	Clean or replace fuel lines.
	Water in fuel.	Check and repair.
	Air entering fuel system.	Check and repair fuel supply system.
	Fuel volume to injection pump low.	Check or replace fuel transfer pump.
	Improper engine oil viscosity/type.	Replace engine oil and filter.

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OUO1023,0002EB5 -19-10FEB11-1/2

Symptom	Problem	Solution
	Improper intake or exhaust valve clearance.	Adjust valve clearance.
	Crankshaft pin or bearing seized.	Regrind crank and replace bearings.
	Piston ring end gaps not correct.	Stagger piston ring gaps.
	Governor not functioning properly.	Repair or replace governor.
	Improper intake or exhaust valve clearance.	Adjust valve clearance.
Symptom	Problem	Solution
Engine Starts But Does Not Continue Running—Excess Exhaust Smoke	Clogged air filter.	Clean or replace air filter.
	Seized intake/exhaust valve.	Replace valve and check valve guide.
	Broken or seized piston ring.	Replace rings and check cylinder.
	Piston ring, piston, or cylinder worn.	Bore or hone cylinder and replace piston.

OUO1023,0002EB5 -19-10FEB11-2/2

Engine Operation Poor

Symptom	Problem	Solution
Low Engine Output—Exhaust Color Normal	Fuel filter clogged.	Replace fuel filter.
	Air entering fuel system.	Check and repair fuel supply system.
	Clogged or cracked fuel lines.	Clean or replace fuel lines.
	Improper intake or exhaust valve clearance.	Adjust valve clearance.
	Compression leakage from valve seat.	Grind valve seat; regrind valves.
	Seized intake/exhaust valve.	Replace valve and check valve guide.
	Leaking cylinder head gasket.	Replace head gasket.
	Crankshaft pin or bearing worn.	Regrind crank and replace bearings.
	Improper engine oil viscosity/type.	Replace engine oil and filter.
	Wrong type of fuel.	Drain and replace fuel.
	Fuel volume to injection pump low.	Check or replace fuel transfer pump.
Low Engine Output—Exhaust Color White	Water in fuel.	Check and repair.
	Wrong type of fuel.	Drain and replace fuel.
	Poor fuel injection pattern.	Clean or replace fuel injector nozzles.
	Incorrect injection pump timing.	Check and adjust fuel injection pump timing.
	Uneven volume of fuel injected.	Check fuel injection pump and injectors.
	Broken or seized piston ring.	Replace rings and check cylinder.
	Piston ring, piston, or cylinder worn.	Bore or hone cylinder and replace piston.
	Piston ring end gaps not correct.	Stagger piston ring gaps.
	Piston rings installed incorrectly.	Install piston rings correctly.
	Intake/Exhaust valves worn.	Check valve guides and stems.
Low Engine Output—Exhaust Color Black	Improper timing between injection pump, intake, and exhaust valves.	Adjust valve clearance. Check valve timing.
	Clogged air filter.	Clean or replace air filter.

Continued on next page

OUO1023,0002EB6 -19-10FEB11-1/4

Symptom	Problem	Solution
	Engine running too hot.	Check thermostat, fan belt tension. Check cooling system for level/leaks. Clean exhaust pipe.
	Water pump/alternator belt loose.	Adjust fan belt tension.
	Wrong type of fuel.	Drain and replace fuel.
	Poor fuel injection pattern.	Clean or replace fuel injector nozzles.
	Incorrect injection pump timing.	Check and adjust fuel injection pump timing.
	Uneven or excess volume of fuel injected.	Check fuel injection pump and injectors.
	Compression leakage from valve seat.	Grind valve seat; regrind valves.
	Seized intake/exhaust valve.	Replace valve and check valve guide.
	Improper timing between injection pump, intake, and exhaust valves.	Adjust valve clearance. Check valve timing.
	Engine at high altitude/temperature.	Use higher output engine.
Symptom	Problem	Solution
Engine Runs Rough	Loud knocking noise during combustion.	Advanced fuel injection pump timing—check and adjust fuel injection pump timing.
	Misfiring	Improper timing between injection pump, intake, and exhaust valves—adjust valve clearance. Check valve timing. Improper intake or exhaust valve clearance—adjust valve clearance. Compression leakage from valve seat. Grind valve seat; regrind valves. Seized intake/exhaust valve. Replace valve and check valve guide. Broken or seized piston ring. Replace rings and check cylinder.
Continued on next page		OUO1023,0002EB6 -19-10FEB11-2/4

Symptom	Problem	Solution
		Crankshaft pin or bearing worn or seized. Regrind crank and replace bearings.
		Connecting rod bolt loose. Check for damage and torque bolts.
		Foreign matter in combustion chamber. Remove head and inspect for damage.
		Excessive timing gear backlash. Measure timing gear backlash.
	Uneven combustion sound.	Clogged air filter. Clean or replace air filter.
		Clogged exhaust pipe. Clean exhaust pipe.
		Water in fuel. Check and repair.
		Wrong type of fuel. Drain and replace fuel.
		Uneven volume of fuel injected. Check fuel injection pump and injectors.
		Poor fuel injection pattern. Clean or replace fuel injector nozzles.
	Engine surges during idle.	Water in fuel. Check and repair.
		Uneven volume of fuel injected. Check fuel injection pump and injectors.
		Poor fuel injection pattern. Clean or replace fuel injector nozzles.
		Governor not functioning properly. Repair or replace governor.
		Broken or seized piston ring. Replace rings and check cylinder.
		Crankshaft pin or bearing worn or seized. Regrind crank and replace bearings.
	Engine surges under load.	Water in fuel. Check and repair.
		Uneven volume of fuel injected. Check fuel injection pump and injectors.

Continued on next page

OUO1023,0002EB6 -19-10FEB11-3/4

Symptom	Problem	Solution
		Poor fuel injection pattern. Clean or replace fuel injector nozzles.
		Governor not functioning properly. Repair or replace governor.
		Seized intake/exhaust valve. Replace valve and check valve guide.
		Crankshaft pin or bearing worn or seized. Regrind crank and replace bearings.
	Excessive engine vibration	Uneven volume of fuel injected. Check fuel injection pump and injectors.
		Poor fuel injection pattern. Clean or replace fuel injector nozzles.
		Seized intake/exhaust valve. Replace valve and check valve guide.
		Broken or seized piston ring. Replace rings and check cylinder.
		Governor not functioning properly. Repair or replace governor.
		Crankshaft pin or bearing worn or seized. Regrind crank and replace bearings.
		Connecting rod bolt loose. Check for damage and torque bolts.
		Improper injection pump timing. Check and adjust valve pump timing.
	Poor return to low speed.	Governor not functioning properly. Repair or replace governor.

OUO1023,0002EB6 -19-10FEB11-4/4

Engine Oil Pressure Low

Symptom	Problem	Solution
Low Oil Pressure	Oil level low.	Fill crankcase to proper oil level.
	Oil filter clogged.	Replace oil filter.
	Incorrect oil type or weight being used.	Drain crankcase and refill with correct oil.
	Oil pump defective.	Remove and inspect oil pump. (See <u>Oil Pump (Engines 3TNV8x-BJT, -BMJT, -BXJT)</u> in Section 30, Group 30.)
	Oil pressure relief valve failed.	Inspect oil pressure relief valve. (See <u>Oil Pump (Engines 3TNV8x-BJT, -BMJT, -BXJT)</u> in Section 30, Group 30.)
	Oil pump screen clogged or pick-up tube cracked.	Remove oil pan and clean screen. Replace pick-up tube. (See <u>Oil Pan and Crankcase Housing Extension</u> for removal of Oil Pan and Strainer.)
	Excessive main or connecting rod bearing clearance.	Determine bearing clearance. (See <u>Connecting Rod Bearing Clearance Check</u> in Section 30, Group 25.)

OUO1023,0002EB7 -19-18DEC12-1/1

Coolant Temperature Abnormal

Symptom	Problem	Solution
Engine Coolant Temperature Above Normal	Coolant level low.	Fill cooling system to proper level.
	Radiator core and/or side screens dirty.	Clean radiator.
	Radiator cap defective.	Replace radiator cap as required. (See Radiator Pressure Cap Test in Section 30, Group 25.)
	Engine overloaded.	Reduce engine load.
	Crankcase oil level too low.	Fill crankcase to proper oil level.
	Fan belt loose or defective.	Replace fan belt/check tensioner.
	Premature belt wear or belt flies off pulley.	Check pulley alignment.
	Thermostat defective.	Test thermostat opening temperature; replace thermostat as required. (See Thermostat Opening Test in Section 30, Group 25.)
	Cylinder head gasket damaged.	Replace cylinder head gasket. (See Check for Head Gasket Failures in Section 20, Group 20.)
	Coolant pump defective.	Replace coolant pump.
Symptom	Problem	Solution
Engine Coolant Temperature Below Normal	Thermostat defective.	Test thermostat opening temperature; replace thermostat as required. (See Thermostat Opening Test in Section 30, Group 25.)

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Coolant in Oil or Oil in Coolant

Symptom	Problem	Solution
Coolant in Oil or Oil in Coolant	Cylinder head gasket faulty.	Look for signs of head gasket failure. (See <u>Check for Head Gasket Failures</u> in Section 20, Group 20.)
	Oil cooler faulty.	Remove and inspect engine oil cooler.
	Cylinder bore(s) cracked.	Locate crack; repair/replace components as required.
	Cylinder head or block cracked	Locate crack; repair/replace components as required.

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Turbocharger Failure Analysis

The following is a guide for diagnosing the cause of turbocharger failures after removal from the engine.

Problem	Possible Cause	Suggested Remedy
Compressor Housing Foreign Object Damage	Objects left in intake system.	Disassemble and inspect intake system for foreign objects. Inspect engine for internal damage.
	Leaking and/or defective intake system.	Inspect air intake system connections including air filter; repair as required. Inspect air intake related engine components.
Compressor Wheel Rub	Bearing failure.	Determine if engine and/or operator contributed to lack of lubrication, contaminated lubrication, excessive temperature, or debris generating engine failure in progress. Correct as required.
	Manufacturing defects.	Correct as required.
Oil and/or Dirt in Compressor Housing	Restricted air intake system.	Inspect and clean air cleaner.
	Prolonged periods of low rpm engine idling.	Check with operator to confirm conditions. (See Operator's Manual.)
	Defective oil seal ring.	Repair as required.
	Restricted oil drain line.	Inspect and clear oil drain line as required.
Oil in Turbine Housing	Internal engine failure.	Inspect and repair engine as required.
	Oil leaking from compressor housing seal.	Verify that oil is in compressor housing and refer to "Oil and/or Dirt in Compressor Housing" as listed earlier in this chart.
Turbine Housing Center Wall Deteriorated	Excessive operating temperature.	Check for restricted air intake. Check engine for overfueling. Check injection pump timing.
Turbine Compressor Wheel Rub	Bearing failure.	Determine if engine and/or operator contributed to lack of lubrication, contaminated lubrication, excessive temperature, or debris generating engine failure in progress. Correct as required.
	Manufacturing defect.	Correct as required.
Foreign Object Damage	Internal engine failure.	Inspect and repair engine as required.
	Objects left in intake system.	Disassemble and inspect air intake system.
	Leaking air intake system.	Correct as required.
Oil and/or Excessive Carbon	Internal engine failure.	Verified by oil in turbine housing. Correct as required.
	Turbine seal failure.	Inspect for excessive heat from overfueling and/or restricted air intake.
	Prolonged periods of low rpm engine idling.	Ask operator to run engine under load or at a higher rpm (See Operator's Manual).
	Restricted oil drain line.	Inspect and clear oil drain line as required.
Center Housing Leaks from Casting	Defective casting.	Replace turbocharger.
	Defective gasket.	Verify if leaks are occurring at gasket joints.
Center Housing Leaks from Joints	Loose attaching screws.	Tighten to specifications.
	Defective gasket.	Inspect and repair as required.
Excessive Carbon Build-Up in Center Housing or on Shaft	Hot engine shutdown.	Review proper operation with operator as shown in operator's manual.
	Excessive operating temperature.	Restricted air intake; overfueling or mistimed engine.
	Restricted oil drain line.	Inspect and clean oil drain lines as required.
	Operating engine at high speeds and loads immediately after start-up.	Idle engine for a few minutes to allow oil to reach bearings before applying heavy loads.

Turbocharger Failure Analysis

OUO1023,0002EBA -19-10FEB11-1/1

Diagnostic Table

Test Conditions:

Machine parked on level surface.
Park brake engaged.
Key switch off unless indicated otherwise.

Test/Check Point	Normal Condition	If Not Normal
Engine dipstick and exterior engine surface	Oil level between "L" and "H" marks.	Change oil and inspect for source of contamination.
	Oil not burnt, or contaminated with metal particles, fuel, or coolant.	Check gaskets, seals, plugs, cylinder head, block, and intake manifold and breather.
	No external leakage, filter clean.	Change oil filter.
Coolant tank and radiator	Coolant level between marks on tank when engine is warm. Coolant in radiator full to top.	Add proper coolant mix.
	Coolant not contaminated with oil, fuel, or discolored brown.	Drain and flush system. Check for source of contamination.
	Radiator screen free of debris.	Clean or replace.
	Hoses not cracked or leaking; clamps and radiator cap tight.	Pressure test radiator and cap. (See Cooling System Pressure Test and Radiator Pressure Cap Test in Section 30, Group 25.)
	Water pump/alternator belt tight; not glazed or cracked.	Replace and adjust belt tension. (See Fan/Alternator Drive Belt Adjustment in Section 30, Group 25.)
Fuel tank, pump, lines, filter, filter shutoff valve	Fan blades not damaged or warped.	Replace fan.
	Fuel level correct, not contaminated; correct grade of fuel; no water or debris in filter bowl/water separator.	Drain and clean fuel tank. Add fresh fuel. Replace filters.
	Filter shutoff valve in "ON" position.	Move to "ON" position.
	Fuel hoses not cracked or leaking.	Replace.
	Fuel hose clamps tight.	Replace or tighten.
Air filter and air intake	Fuel tank does not have vacuum.	Replace fuel tank vent hose.
	Air filter outlet hose not cracked; clamps tight.	Replace hose and/or tighten clamps.
	Elements not plugged. Air filter housing sealed; no dirt tracking inside filter element.	Replace element or housing.
Fuel shutoff solenoid (Key in "START" position)	Air filter restriction indicator not leaking	Replace indicator.
	Fuel shutoff solenoid must pull in and stay in when key is returned to "ON". Listen for clicking as key is cycled.	If solenoid will not pull in and hold in, see "Fuel Shutoff Solenoid Circuit Diagnosis" in Electrical section.
	Fuel filter/water separator	
Hand throttle control lever linkage. Throttle pedal linkage (gear only).	Fuel level visible in filter bowl.	Drain water from bowl.
	Fuel bowl does not contain water.	Replace fuel filter. Recheck.
	Fuel present at injection pump inlet hose.	Test fuel pump.
Intake and exhaust valves	Full movement of governor control arm from idle to full speed.	Repair; replace or adjust linkage. (See Throttle Rod Adjustment in Section 30, Group 25.)
	Valve clearance within specification (engine cold).	Adjust valves. (See Valve Lift Check in Section 30, Group 25.)
Fuel is reaching injectors	Valves not sticking.	Check valve guides and stems.
	Crack fuel injection lines at injectors. Crank engine. (Be sure that fuel shutoff solenoid has pulled in.) Fuel leaks out.	No fuel present: Check fuel shutoff valve is open, fuel level in tank, inspect filter/separator element. Test fuel pump.
Injectors are working properly	Injector spray pattern is normal and cracking pressure is within specifications.	Check spray pattern and cracking pressure. (See Fuel Injection Nozzle Test in Section 30, Group 25.)
Perform cylinder compression test at fuel injector ports	Cylinder compression within specification. Pressure difference between cylinders within specification.	Rebuild engine.
Flywheel and starting motor	Minimum cranking rpm within specification.	See "Starter Amp Draw Test" in Electrical section.

Continued on next page

OUO1023,0002EBB -19-15FEB11-1/2

Diagnostics

Test/Check Point	Normal Condition	If Not Normal
Fuel injection pump static timing test	Timing should be correct. (Remove pump as the LAST possible solution.)	Have injection pump static timing adjustment performed by a qualified service repair shop. (See <u>Injection Pump Timing—EPA Engines</u> in Section 30, Group 25.)
Injection pump slow idle speed (engine running)	Engine runs at rpm specification.	(See <u>Slow Idle Adjustment</u> in Section 30, Group 25.)
Governor	Engine runs smoothly through out rpm range with low smoke and good power.	Have governor torque capsule adjusted by a certified CARB/EPA service center.
Oil pressure sender port	Oil pressure to specification.	Test engine oil pressure. (See <u>Engine Oil Pressure Test</u> in Section 30, Group 25.)
Thermostat	Opening temperature within specification.	Perform thermostat opening test. (See <u>Thermostat Opening Test</u> in Section 30, Group 25.)
Muffler	Not restricted.	Replace muffler.

OUO1023,0002EBB -19-15FEB11-2/2

Check for Head Gasket Failures

Head gasket failures generally fall into three categories:

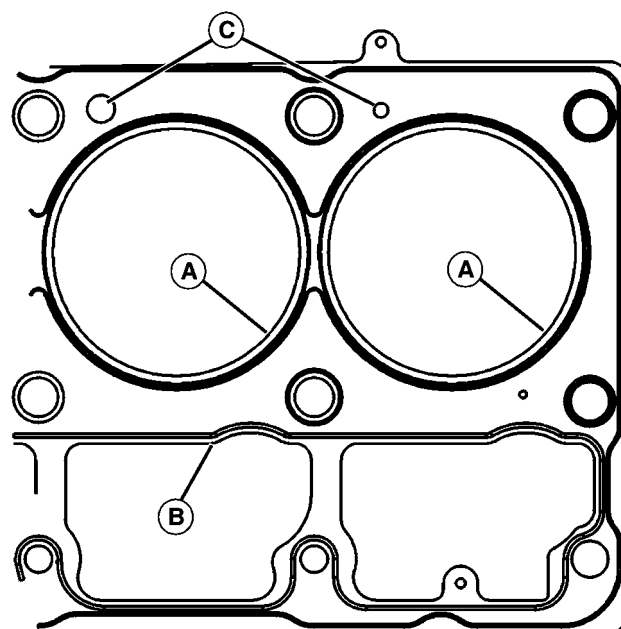
- Combustion seal failures
- Coolant seal failures
- Oil seal failures

Combustion seal failures occur when combustion gases escape between the cylinder head and head gasket combustion flange, or between the combustion flange and cylinder bore. Leaking combustion gases may vent to an adjacent cylinder, to a coolant or oil passage, or externally.

Coolant or oil seal failures occur when oil or coolant escapes between the cylinder head and gasket body, or between the cylinder block and gasket body. The oil or coolant may leak to an adjacent coolant or oil passage, or externally. Since oil and coolant passages are primarily on right-hand (camshaft) side of engine, fluid leaks are most likely to occur in that area.

Follow these diagnostic procedures when a head gasket joint failure occurs or is suspected.

1. Before starting or disassembling engine, conduct a visual inspection of machine and note any of the following:
 - a. Oil or coolant in head gasket seam, or on adjacent surfaces.
 - b. Displacement of gasket from normal position.
 - c. Discoloration or soot from combustion gas leakage.
 - d. Leaking radiator, overflow tank, or hoses.
 - e. Leaking coolant from coolant pump weep hole.
 - f. Damaged or incorrect radiator, fan, or shroud.
 - g. Obstructed air flow or coolant flow.
 - h. Worn or slipping belts.
 - i. Damaged or incorrect pressure cap.
 - j. Presence of oil in coolant.
 - k. Low coolant levels or improper coolant.
 - l. Unusually high or low oil levels.
 - m. Oil degradation, dilution, or contamination.
 - n. Indications of fuel or timing adjustments.
 - o. Unburned fuel or coolant in exhaust system.
2. Obtain coolant and oil samples for further analysis.
3. Start and warm up engine if it can be safely operated. Examine all potential leakage areas again as outlined previously. Using appropriate test and measurement equipment, check for the following:
 - a. White smoke, excessive raw fuel, or moisture in exhaust system.
 - b. Rough, irregular exhaust sound, or misfiring.



Diagnosing Head Gasket Joint Failures

A—Combustion Sealing Area C—Coolant Sealing Areas
B—Oil Sealing Areas

- c. Air bubbles, gas trapped in radiator/overflow tank.
 - d. Loss of coolant from overflow.
 - e. Excessive cooling system pressure.
 - f. Coolant overheating.
 - g. Low coolant flow.
 - h. Loss of cab heating (if equipped) (air lock).
4. Shut down engine. Recheck crankcase, radiator, and overflow tank for any significant differences in fluid levels, viscosity, or appearance.
 5. Compare your observations from above steps with the diagnostic charts earlier in this group. If diagnostic evaluations provide conclusive evidence of combustion gas, coolant, or oil leakage from head gasket joint, the cylinder head must be removed for inspection and repair of gasket joint components.

Combustion Seal Leakage

Symptoms:

1. Exhaust from head gasket crevice
2. Air bubbles in radiator/overflow tank
3. Coolant discharge from overflow tube
4. Engine overheating
5. Power loss
6. Engine runs rough

Continued on next page

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7. White exhaust smoke
8. Loss of cab heat
9. Gasket section dislodged, missing (blown)
10. Coolant in cylinder
11. Coolant in crankcase oil
12. Low coolant level

Possible Causes:

1. Low head bolt clamping loads
2. Cracked/deformed gasket combustion flange
3. Out-of-flat/damaged/rough cylinder head surface
4. Missing/mislocated gasket fire ring
5. Excessive fuel delivery
6. Advanced injection pump timing
7. Hydraulic or mechanical disturbance of combustion seal

Coolant Seal Leakage:**Symptoms:**

NOTE: Cracked cylinder head or cylinder bores may also allow combustion gas leakage into coolant.

1. Coolant discharge from head gasket crevice
2. Coolant in crankcase oil
3. Low coolant level
4. High oil level
5. Coolant discharge from crankcase vent

Possible Causes:

1. Low head bolt clamping loads
2. Out-of-flat/damaged/rough block surface
3. Out-of-flat/damaged/rough cylinder head surface
4. Oil or coolant overheating
5. Cracks/creases in gasket body surfaces
6. Damage/voids in elastomer beading

Oil Seal Leakage:**Symptoms:**

1. Oil discharge from head gasket crevice
2. Oil in coolant
3. Low crankcase oil level
4. Reduced oil to rocker arms (noisy)

Possible Causes:

1. Low head bolt clamping loads
2. Out-of-flat/damaged/rough block surface
3. Out-of-flat/damaged/rough cylinder head surface
4. Oil or coolant overheating
5. Cracks/creases in gasket body surfaces

NOTE: Defective oil cooler may also allow oil leakage into coolant.

6. Damage/voids in elastomer beading

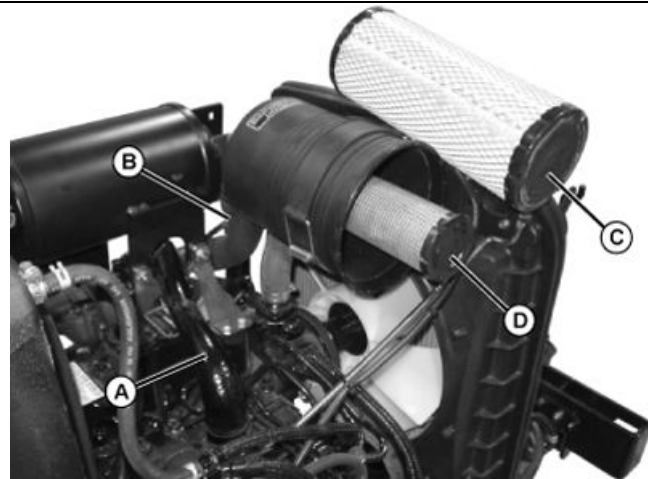
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Check Air Intake System

1. Check condition of air intake hose(s) (A and B). Replace hoses that are cracked, split, or otherwise in poor condition.
2. Replace air cleaner primary filter element (C). Replace secondary element (D) if primary element has holes in it.
3. Check hose clamps for tightness. Replace clamps that cannot be tightened. This will help prevent dust from entering the air intake system, causing serious engine damage.

A—Air Cleaner-to-Turbocharger Hose
B—Turbocharger-to-Intake Manifold Hose

C—Primary Filter Element
D—Secondary Filter Element



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Air Restriction Indicator Test

Reason:

To check operation of air filter restriction indicator and check air intake system for leaks, restrictions, or obstructions.

Procedure (Simulated Excess Restriction)

1. Park machine safely. See Parking Safely in the Safety Section.
2. Raise hood.
3. Start and run engine at SLOW idle.
4. Cover the air cleaner intake tube (A) with a piece of cardboard.
5. Watch air filter restriction indicator. The indicator light should illuminate.
6. Remove cardboard and stop engine.

Results:

If restriction indicator DID NOT illuminate, check for:

- Loose or damaged hose clamps.
- Air leaks in air filter to intake manifold hose.
- Air leaks in intake manifold.



A—Air Cleaner Intake Tube

- Air leaks at indicator mounting threads.
- Cracked indicator housing or diaphragm.
- Clogged screen inside indicator mounting nipple.
- Damaged electrical circuit. See diagnosis in the Electrical section.

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OUC1023,0002EBE -19-10FEB11-1/1

Check for Intake and Exhaust Restrictions

Low power, low boost pressure, and excessive black exhaust smoke can be caused by an intake air or exhaust restriction.

1. Inspect the exhaust pipe and muffler for damage or possible restrictions.

2. Inspect the intake piping. Look for collapsed pipes, dented pipes, cracked hose, and loose connections. Replace components as needed.

OUC1023,0002EBF -19-10FEB11-1/1

Fan/Alternator Drive Belt Adjustment

Reason:

To keep correct tension on the drive belt to the water pump and alternator. To prevent shortened belt and bearing life.

Equipment:

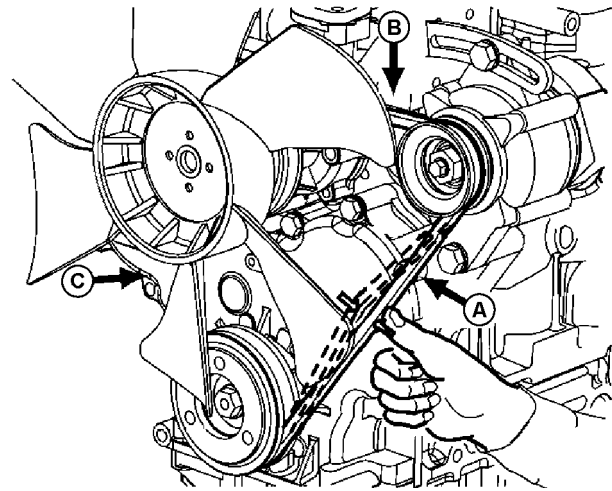
- JDG529 or JDST28 Belt Tension Gauge
- Straight Edge

Procedure:

1. Park machine safely. (See Park Machine Safely in Section 10, Group 05.)
2. Allow engine to cool.
3. Raise hood.
4. Apply a force of **98 N (22 lb.-force)** to the alternator belt midway between water pump (A), crankshaft pulley (B), or alternator (C) using a belt tension gauge and a straight edge.
5. The deflection should be to specification.

Specifications:

Deflection Point	Used Belt	New Belt
A	10—14 mm (0.40—0.55 in.)	8—12 mm (0.32—0.47 in.)
B	7—10 mm (0.28—0.40 in.)	5—8 mm (0.20—0.32 in.)
C	9—13 mm (0.35—0.51 in.)	7—11 mm (0.28—0.43 in.)



A—Between Alternator and Crankshaft
B—Between Water Pump and Alternator

C—Between Crankshaft and Water Pump

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Results:

- If deflection is not within specifications, loosen both alternator mounting cap screws/nuts. Apply force to FRONT alternator housing only (near the belt) until tension is correct. Tighten cap screws/nuts.

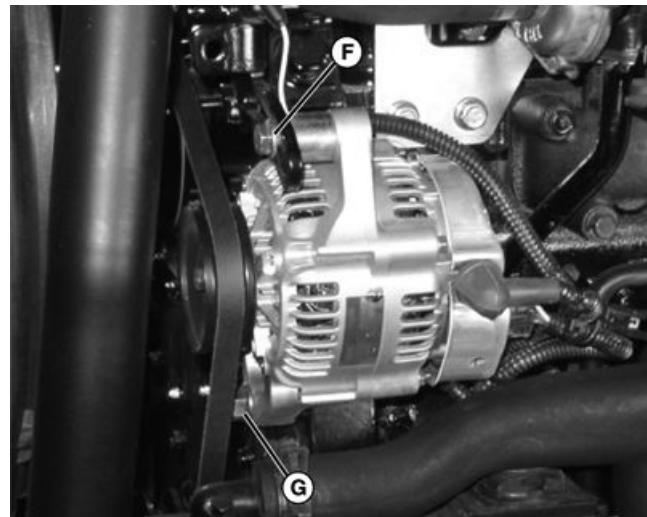
OUO1023,0002EC0 -19-10FEB11-1/2

Adjusting Alternator Belt Tension:

1. Loosen adjusting bolt (F).
2. Loosen alternator pivot bolt (G).
3. Push alternator inward to loosen belt, and outward to tighten belt.
4. Tighten bolts.
5. Check belt tension.

F—Adjusting Bolt

G—Alternator Pivot Bolt



LVAL13735—UN—18NOV10

OUO1023,0002EC0 -19-10FEB11-2/2

Throttle Rod Adjustment

Reason:

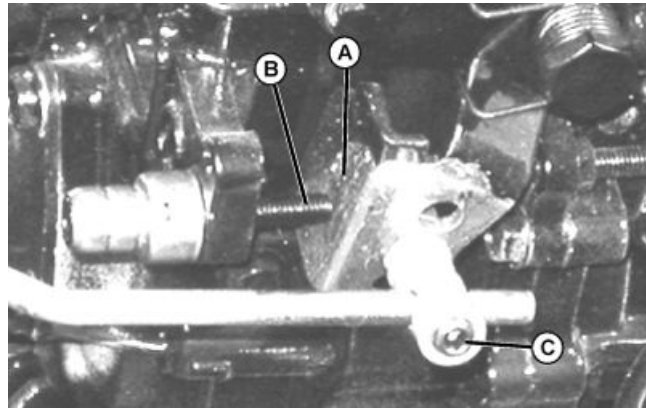
To ensure that throttle linkage, and foot pedal linkage is adjusted correctly, and allows full high idle and slow idle position of governor throttle lever.

Equipment:

- Metric Wrenches
- Pliers

Procedure:

1. Park machine safely. See Parking Safely in the Safety Section.
2. Allow engine to cool.
3. Raise hood.
4. Move throttle control lever to high idle position.
5. Governor lever (A) should be touching high idle limit screw (B).
6. If not, loosen set screw (C) on throttle rod and adjust rod until throttle lever is touching the stop and there is no excessive strain on the linkage.



A—Governor Lever
B—High Idle Limit Screw

C—Set Screw

7. Hold rod and governor lever in position and tighten set screw.

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Slow Idle Adjustment

IMPORTANT: Avoid Damage! The slow idle adjustment is the only adjustment that can be made on this engine.

The fast idle and torque capsule adjustments are pre-set by the engine manufacturer to comply with strict EPA/CARB emissions requirements, and are adjustable **ONLY** by authorized diesel service facilities.

Reason:

To achieve proper slow idle rpm setting. Provides adequate rpm to keep the engine running smoothly without stalling.

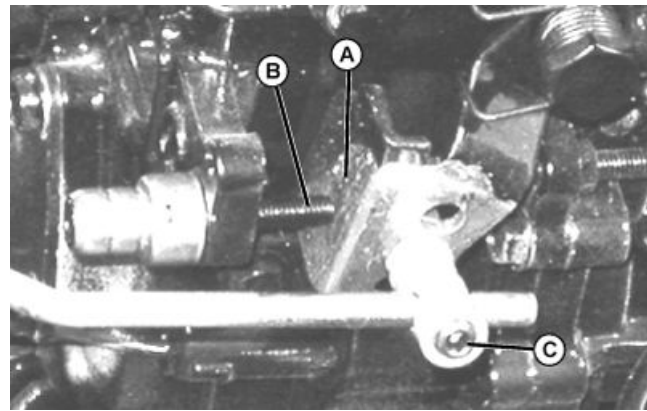
Equipment:

- JT05719 Hand Held Digital Tachometer

NOTE: Make sure that the air cleaner is clean and not restricted. Replace the air cleaner element as necessary.

Procedure:

1. Park machine safely. (See Park Machine Safely in Section 10, Group 05.)
2. Raise hood.
3. Place a small piece of reflective tape on the crankshaft pulley.
4. Start the engine and run for 5 minutes to attain operating temperature.
5. Move the throttle lever to slow idle position.
6. Use JT05719 Hand Held Digital Tachometer to check engine speed at the crankshaft pulley.
7. Visually check that the injection pump throttle lever (A) is against slow idle stop screw. Slow idle speed is set to specification.



A—Injection Pump Throttle Lever
B—Nut

C—Slow Idle Stop Screw

Specification

PowrReverser	
Machines—Speed.....	950 ± 50 rpm
eHydro—Speed.....	1000 ± 50 rpm

Results:

- If the slow idle rpm is not according to specifications, loosen the nut (B). Turn the slow idle stop screw (C) clockwise to increase the engine speed, or counterclockwise to decrease the engine speed until the slow idle speed is correct. After adjustment, tighten the nut.

LVAL13900—UN—14JAN11

OUC1023,0002EC2 -19-10FEB11-1/1

Cylinder Compression Test

Reason:

To determine the condition of the pistons, rings, cylinder walls, and valves.

Equipment:

- JT01682 Compression Gauge Assembly
- JT07043 Pressure Gauge 0 - 6900 kPa (0 - 1000 psi)
- JDG560 Adapter

Procedure:

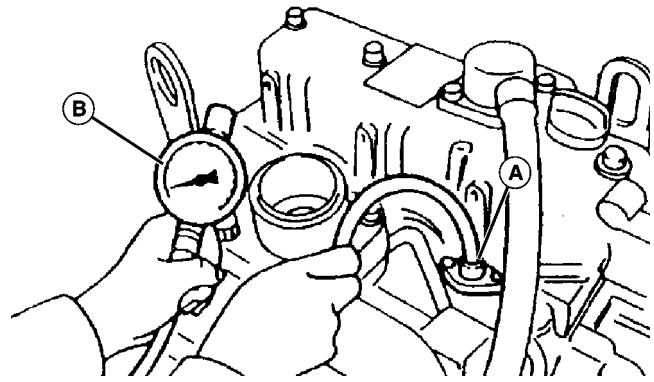
1. Run engine for 5 minutes to bring to operating temperature. Shut off engine.
2. Remove the injection nozzles.
3. Remove the heat protector from end of injector and install JDG560 adapter (A).
4. Install JT01682 Compression Gauge Assembly (B) and JDG560 Adapter.
5. Disconnect the fuel control solenoid connector.

IMPORTANT: Avoid Damage! DO NOT overheat starting motor during test.

6. Crank the engine for five seconds with the starting motor. Minimum cranking speed is 250 rpm.
7. Record the pressure reading for each cylinder.

Specification

Cylinder Compression—3TNV84—Pressure.....	3240 ± 100 kPa (32.4 ± 1 bar) (470 ± 14.5 psi)
Cylinder Compression—3TNV84 (Minimum)—Pressure.....	2550 ± 100 kPa (25.5 ± 1 bar) (370 ± 14.5 psi)
Cylinder Compression—3TNV84T—Pressure.....	2940 ± 100 kPa (29.4 ± 1 bar) (426 ± 14.5 psi)
Cylinder Compression—3TNV84T (Minimum)—Pressure.....	2450 ± 100 kPa (24.5 ± 1 bar) (355 ± 14.5 psi)



A—JDG560 Adapter

B—JT01682 Compression Gauge Assembly

Cylinder Compression—3TNV88—Pressure.....	3430 ± 100 kPa (34.3 ± 1 bar) (497 ± 14.5 psi)
Cylinder Compression—3TNV88 (Minimum)—Pressure.....	2750 ± 100 kPa (27.5 ± 1 bar) (399 ± 14.5 psi)
Cylinder Compression—Difference Between Cylinders—Pressure.....	200—300 kPa (2—3 bar) (29—43 psi)
Minimum Cranking Speed—Speed.....	250 rpm

Results:

- If pressure reading is below specification, squirt clean engine oil into cylinders through injector ports and repeat test.
- If pressure increases significantly, check piston, rings, and cylinder walls for wear or damage.
- If pressure does not increase significantly after retest, check for leaking valves, valve seats, or cylinder head gasket.

OUO1023,0002EC4 -19-10FEB11-1/1

LVAL13745—UN—18NOV10

Valve Clearance Adjustment

Reason:

To maintain proper clearance between valves and rocker arms for maximum compression and valve train life.

Equipment:

- Feeler Gauge
- 10 mm End Wrench
- Flat Blade Screwdriver
- 17 mm Wrench

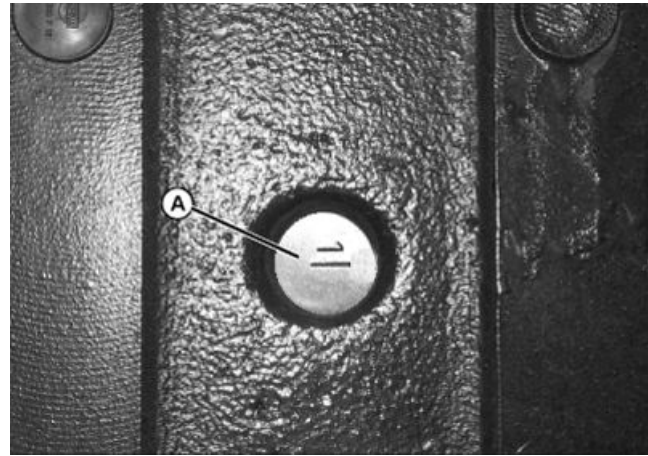
Procedure:

1. Park machine safely. See Park Machine Safely in Section 10, Group 05.)
2. Raise hood.
3. The engine must be cool (room temperature) before the valve clearance is checked.
4. Be sure that ignition key is OFF before attempting to turn engine by hand.
5. Remove the rocker arm cover.

NOTE: "Top dead center (TDC)" is when the number one piston is at its highest point of travel in the cylinder on the compression stroke. Number one cylinder is located at rear of engine (flywheel side).

6. Locate the inspection hole (A) in right side of the transmission tunnel. The flywheel can be seen inside the inspection hole.

NOTE: When top dead center is reached, the rocker arms for that cylinder will be motionless as the



LVAL13902—UN—14JAN11

A—Inspection Hole

crankshaft if rotated. If rocker arms are still moving when TDC is approached, rotate crankshaft one full revolution and try again.

7. Turn the crankshaft pulley while watching the flywheel inside the inspection hole. Align the number one TDC mark (A) on the flywheel with the pointer on the tunnel.
8. Try to move rocker arms and/or push rods for No. 1 cylinder:
 - If the rocker arms and push rods are loose, the piston is at TDC of the compression stroke. Go to next step.
 - If the rocker arms and/or push rods are not loose, rotate the flywheel one revolution (360°). Recheck the rocker arms and push rods.

Continued on next page

OUC1023,0002EC5 -19-10FEB11-1/3

9. Slide a feeler gauge between the valve cap (B) and rocker arm to measure the clearance.
10. To adjust the valves, loosen the lock nut (D) and turn the adjusting screw (C) until the blade of the feeler gauge can be inserted between the rocker arm and valve cap. Hold the adjusting screw while tightening the lock nut.

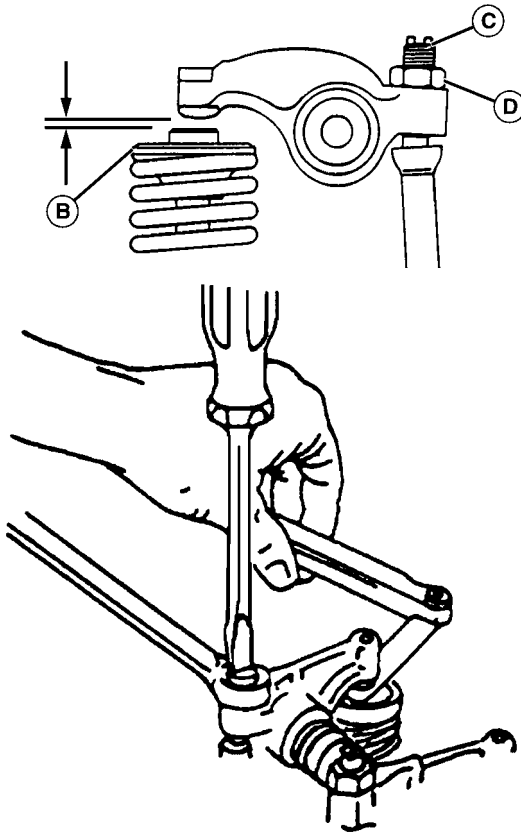
Specification

Valve—Clearance.....0.15—0.25 mm
(0.006—0.010 in.)

11. Recheck the valve clearance after tightening the lock nut.

B—Valve Cap
C—Adjusting Screw

D—Lock Nut

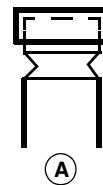


LVAL13747 —UN—18NOV10

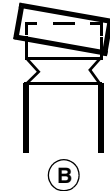
LVAL13748 —UN—18NOV10

OUO1023,0002EC5 -19-10FEB11-2/3

12. Check that the valve cap on the valve stem remained seated on the valve and inside the valve spring retainer.
13. Turn the crankshaft pulley counter clockwise (as viewed from operator's seat or flywheel end) approximately 2/3 of a revolution (240°) while watching the observation hole for the number three timing mark.
14. Check that the rocker arms and push rods for cylinder number three are loose.
15. Repeat steps 7—13 for number three cylinder.
16. Repeat steps 7—11 for number two cylinder.
17. Replace the rocker arm cover, air cleaner bracket and housing, and the muffler.



A—Normal



B—Not Normal

LVAL13749 —UN—18NOV10

OUO1023,0002EC5 -19-10FEB11-3/3

Valve Lift Check

Reason:

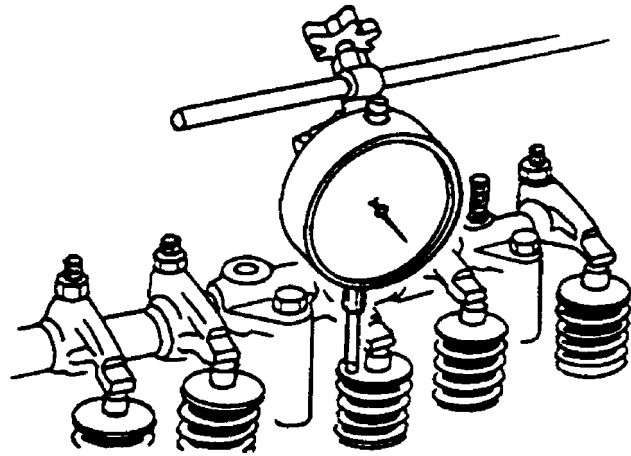
To test for excessive wear on camshaft lobes, cam followers, rocker arms, valve stems, valve caps, or bent push rods.

Equipment:

- Dial Indicator with magnetic base

Procedure:

1. Park machine safely. See Parking Safely in the Safety Section.
2. Allow engine to cool.
3. Raise hood.
4. Remove the rocker arm cover.
5. Check that valve clearance is within specification. Adjust if necessary.
6. Fasten the dial indicator to the engine and position the indicator tip on the valve retainer. The valve must be fully closed and the rocker arm must move freely.
7. Zero the dial indicator.
8. Manually turn the crankshaft pulley clockwise (from the fan end).
9. Observe the dial indicator as the valve is moved to the full open position. Repeat for each valve.



LVAL13750—UN—18NOV10

Results:

- If valve lift is less than specification, remove and inspect camshaft, camshaft followers, push rods, valve caps and stems, and/or rocker arms for wear or damage.

Specification

Valve—Lift..... 7.5 mm
(0.300 in.)

- The valve lift should be the same for all valves. If one or more valves have less travel than the others, remove and inspect the camshaft, followers and push rods. (See [Camshaft](#) in Section 30, Group 30.) If the camshaft, followers and push rods are within specification remove and inspect the cylinder head. (See [Cylinder Head and Valves Removal and Installation](#) in Section 30, Group 30.)

OUC1023,0002EC6 -19-10FEB11-1/1

Radiator Bubble Test

Reason:

To determine if compression pressure is leaking from combustion cylinder into water jacket.

Equipment:

- JDG560 Adapter

Procedure:

1. With the coolant at the proper level and the radiator cap tight, run the engine for 5 minutes to bring it to operating temperature.
2. Remove the cap from the recovery tank.
3. Check for bubbles coming from the overflow hose at the bottom of the tank.

If bubbles are present, isolate the source of the compression leak.
4. Remove the injection nozzles.
5. Install JDG560 Adapter in the injection port of the cylinder to be tested.

6. Move the piston to the bottom of the stroke with intake and exhaust valves closed.
7. Connect the hose from a compressed air source to the adapter.
8. Apply shop air pressure into the cylinder.
9. Check for bubbles in the recovery tank or air escaping from the muffler, air cleaner, or oil fill opening.
10. Repeat for each cylinder.

Results:

If bubbles are present:

- Check for cracks in cylinder head and block. Check for damaged head gasket.

If air escapes from muffler:

- Check for worn exhaust valve.

If air escapes from air cleaner:

- Check for worn intake valve.

If air escapes from engine oil fill:

- Check for worn piston rings.

OUO1023,0002EC7 -19-10FEB11-1/1

Thermostat Opening Test

Reason:

To determine opening temperature of thermostat.

Equipment:

- Thermometer
- Glass Container
- Heating Unit

Procedure:

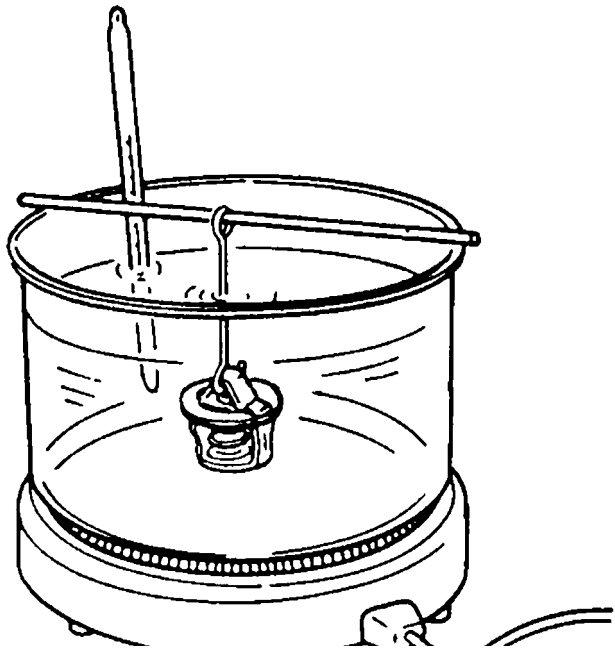
1. Park machine safely. (See [Park Machine Safely](#) in Section 10, Group 05.)
2. Allow engine to cool.
3. Raise hood.
4. Remove thermostat. (See [Thermostat Removal and Installation](#) in Section 30, Group 30.)

CAUTION: Avoid Injury! DO NOT allow thermostat or thermometer to rest against the side or bottom of glass container when heating water. Either may rupture if overheated.

5. Suspend the thermostat and a thermometer in a container of water.
6. Heat and stir the water. Observe opening action of thermostat and compare temperatures with specifications.

Specification

Begin Opening—Temperature.....	69.5—72.5 °C (157—163 °F)
Fully Open—Temperature.....	85 °C (185 °F)



LVAL13744—UN—18NOV10

Minimum Lift Height
Above 85 °C (185 °F)—Height..... 8 mm
(0.315 in.)

7. Remove the thermostat and observe the closing action as it cools.

Results:

- If thermostat does not open according to specifications, replace.
- If closing action is not smooth and slow, replace thermostat.

OUO1023,0002EC3 -19-10FEB11-1/1

Radiator Pressure Cap Test

Reason:

Test the radiator cap for operating in the correct pressure range.

Equipment:

- D05104ST Cooling System Pressure Pump
- JDG692 Radiator Pressure Test Kit (Adapters)

Procedure:

1. Install the radiator cap on the pressure pump.

2. Apply pressure. Pressure valve in the cap should open at specification.

Specification

Radiator Pressure Cap—Opening—Pressure.....	88 kPa (0.88 bar) (12.8 psi)
---	------------------------------------

Results:

- If the cap leaks, retighten and test again. Replace the cap if pressure is not within specification.

OUO1023,0002EC9 -19-10FEB11-1/1

Cooling System Pressure Test

Reason:

Inspect the cooling system for leaks.

Equipment:

- D05104ST Cooling System Pressure Pump
- JDG692 Radiator Pressure Test Kit (Adapters)

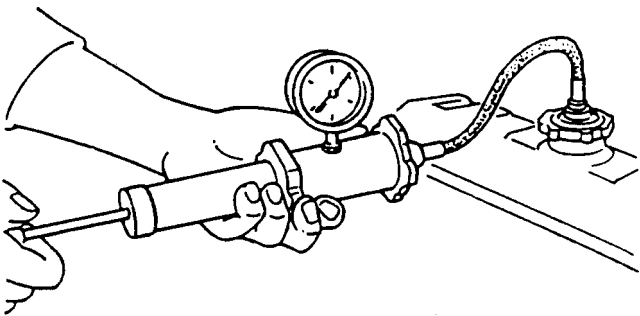
Procedure:

1. Remove the cap and attach the pressure pump to radiator.
2. Apply pressure to specification.

Specification

Cooling System—Pres-	
sure.....	88—97 kPa
	(0.88—0.97 bar)
	(12.8—14.0 psi)

3. Check for leaks throughout the cooling system. Keep system pressurized for 5 minutes.



LVAL13752 —UN—18NOV10

Results:

- Pressure should hold at specification. If pressure decreases, check for leaks. Repair leaks or replace parts as necessary.
- If the pressure test still indicates leakage after all external leaks have been stopped, a defective head gasket, cracked block, or cylinder head may be the cause. (See Radiator Bubble Test in Section 30, Group 25.)

OOU1023,0002ECA -19-10FEB11-1/1

Engine Oil Pressure Test

Reason:

To determine if engine bearings or lubrication system components are worn.

Equipment:

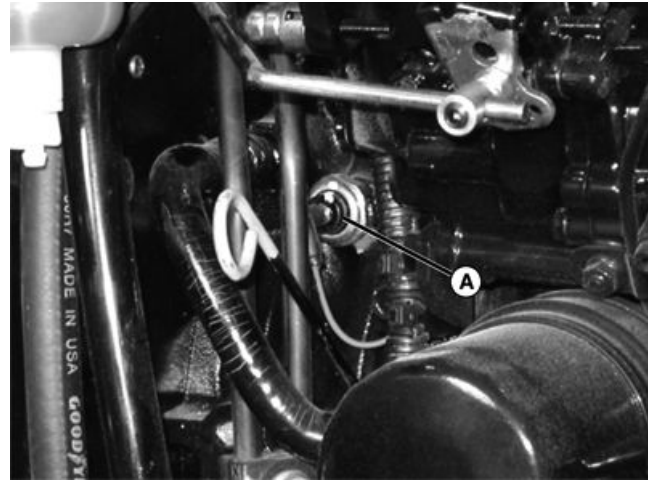
- JT03017 Hose Assembly
- JT05577 Pressure Gauge (100 psi)
- JT03349 Connector

Procedure:

1. Park machine safely. See Parking Safely in the Safety Section.
2. Allow engine to cool.
3. Raise hood.
4. Remove wire to oil pressure switch (A).
5. Unscrew oil pressure switch from block.
6. Install JT03349 Connector into block.
7. Connect JT03017 Hose Assembly and JT05577 Pressure Gauge.

IMPORTANT: Avoid Damage! Stop running engine if no oil pressure is present.

8. Start the engine. If pressure reading is below **70 kPa (0.7 bar) (10 psi)** at slow idle rpm, STOP THE ENGINE.
9. If the oil pressure is at least **70 kPa (0.7 bar) (10 psi)** run the engine approximately five minutes to heat the oil. Check the oil pressure at **2600 rpm**.



A—Oil Pressure Switch

Results:

- If the oil pressure is not within specifications, inspect the oil pump and relief valve.

Specification

High Idle (Rated Speed)—Pressure.....	294—392 kPa (2.94—3.92 bar) (42.6—56.8 psi)
Slow Idle (Minimum)—Pressure.....	70 kPa (0.7 bar) (10 psi)

- If the oil pump is within specifications, the engine may have parts worn beyond specifications. (See [Engine Troubleshooting](#) in Section 20, Group 20.)

OUO1023,0002ECB -19-10FEB11-1/1

Check for Excessive Engine Crankcase Pressure (Turbocharged Engines)

Excessive blow-by coming out of the crankcase breather tube indicates that either the turbocharger seals are faulty or the piston rings and cylinder bores are not adequately sealing off the combustion chamber. This is a comparative check that requires some experience to determine when blow-by is excessive.

Run engine at high idle and check crankcase breather tube. Look for significant fumes and/or dripping oil coming out of the breather tube at fast idle, with no load.

If excessive blow-by is observed, perform the following to determine if the turbocharger is causing the blow-by:

1. Remove the turbocharger oil drain line where it connects to the engine block and run line into a bucket.
2. Run engine at high idle, slightly loaded, and determine if boost pressure is forcing oil through the drain line. Check crankcase breather tube to determine if blow-by has decreased.
3. If it appears that boost pressure is forcing oil through the drain line, and/or blow-by decreases with the drain line disconnected from block, replace the turbocharger.

OUO1023,0002ECC -19-10FEB11-1/1

Fuel System Leakage Test

Reason:

Tests the fuel system plumbing for external leakage. This test also determines if air is entering the fuel system at connections, allowing fuel to siphon back to tank.

Procedure:

1. Disconnect the fuel supply line and return line at the fuel tank.
2. Place the fuel return line into a suitable container to catch drained fuel.

IMPORTANT: Avoid Damage! DO NOT apply more than 103 kPa (1.03 bar) (15 psi) air pressure to the fuel system. Damage to the injection pump or personal injury may result.

3. Apply **34—69 kPa (0.34—0.69 bar) (5—10 psi)** air pressure to fuel supply hose until all fuel is drained from the system.
4. Plug the end of the fuel return hose.
5. Apply **34—69 kPa (0.34—0.69 bar) (5—10 psi)** air pressure to the fuel system at the fuel supply line. **DO NOT** exceed a maximum pressure of **103 kPa (1.03 bar) (15 psi)**.
6. Apply liquid soap and water solution to all joints and connections in the fuel system, and inspect for leaks.

Results:

- Find leaks and repair or replace parts as necessary.

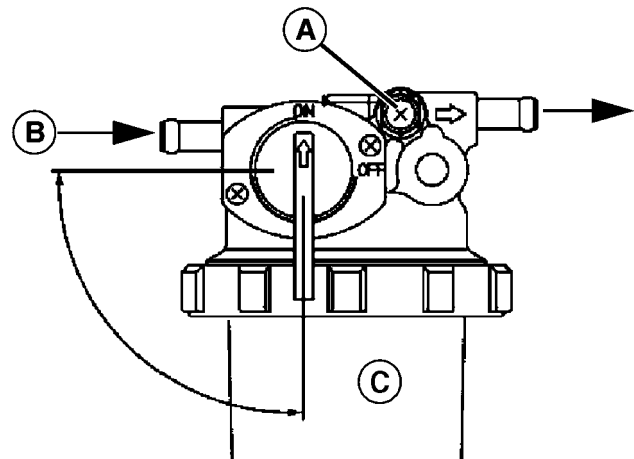
OUO1023,0002ECD -19-10FEB11-1/1

Bleed Fuel System

Reason:

The machine incorporates a self bleeding fuel system which forces air out of the fuel filter, injection pump, and injection nozzles, and vents it back to the fuel tank. Fuel system bleeding is usually not necessary after a repair. If the system is completely drained and will not self-prime without overheating the starter, proceed as follows:

1. Park machine safely. See Parking Safely in the Safety Section.
2. Raise hood.
3. Assure that all fuel line connections are securely tightened.
4. Be sure that fuel tank is not empty, and fuel valve on fuel filter is OPEN ("O" position).
5. Place the key switch ON for 10—15 seconds to allow the electric fuel pump and fuel system to bleed most of the air back to the tank through the return lines.
6. If the fuel filters were replaced and/or the fuel lines drained, loosen the air bleeding bolt (A) on the fuel water separator by turning it 2-3 turns.



A—Air Bleeding Bolt
B—Close Position

C—Open Position

7. When the fuel comes out clear and does not have bubbles, tighten the air bleeding bolt.

LVAL13754 —UN—18NOV10

OUO1023,0002ECE -19-10FEB11-1/1

Fuel Supply Pump Pressure Test

Reason:

To determine supply pump operating pressure.

Equipment:

- JDG356 Fuel Pump Pressure Test Kit

Test Conditions:

- Fuel temperature 15°—25 °C (59—79 °F)

Flow Test:

1. Park machine safely. See Parking Safely in the Safety Section.
2. Allow engine to cool.
3. Raise hood.
4. Disconnect fuel shutoff solenoid wire.

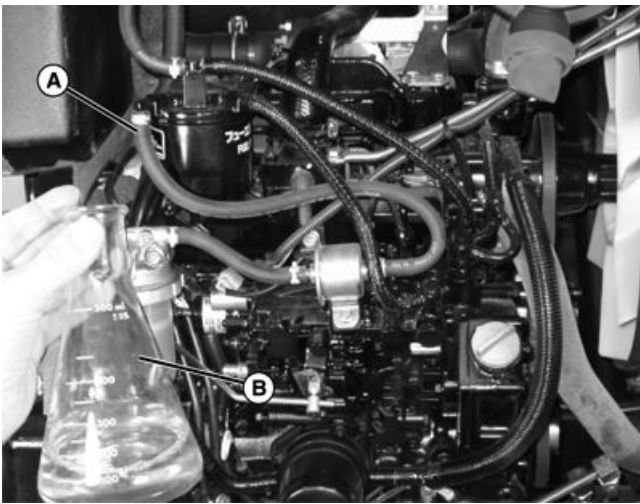
NOTE: Do not start engine for this test. The electric fuel pump operates with the key switch ON.

5. Disconnect fuel supply pump outlet hose (A) from fuel filter and place end of hose into a clean graduated container (B).
6. Collect fuel in graduated container (B) as key switch is turned ON for 15 seconds.
7. Compare fuel amount to specification.

	Specification
Fuel Flow in 15 seconds—Volume.....	100 mL (minimum) (3.4 oz.)

Pressure Test:

1. Install the hose and gauge to outlet hose (A).



Open station model shown.

A—Fuel Supply Pump Outlet Hose B—Graduated Container

2. Place key switch in ON position.
3. Record fuel pressure reading on gauge.

Results:

- If the pressure does not meet specification, replace the fuel pump.

	Specification
Fuel Pressure (maximum)—Pressure.....	37.3 kPa (0.37 bar) (5.4 psi)

LVAL13755—UN—18NOV10

OOU1023,0002ECF -19-10FEB11-1/1

Injection Pump Timing—EPA Engines

⚠ CAUTION: Avoid Injury! DO NOT adjust the fuel injection pump timing. For most engine problems, the fuel injection pump timing will not have to be adjusted. If the engine performed well at one time, then performance dropped, the fuel injection timing is **NOT** the problem.

Fuel injection timing, once set by the engine manufacturer, should **NOT** change during the life of the engine.

IMPORTANT: Avoid Damage! Fuel injection pump timing should **NOT** change during the life of the engine unless the pump has been altered illegally, or there is excessive wear to the injection pump camshaft lobes and lifters.

First check the fuel quality, fuel supply, fuel injectors, air intake system, and engine compression in all cylinders before considering fuel injection timing problems.

If all other possibilities have been ruled out and it is determined that the fuel injection pump and governor assembly are in need of repair, they must be replaced **ONLY** as complete assemblies.

Only an authorized factory trained technician is allowed to remove and install these assemblies.

Equipment:

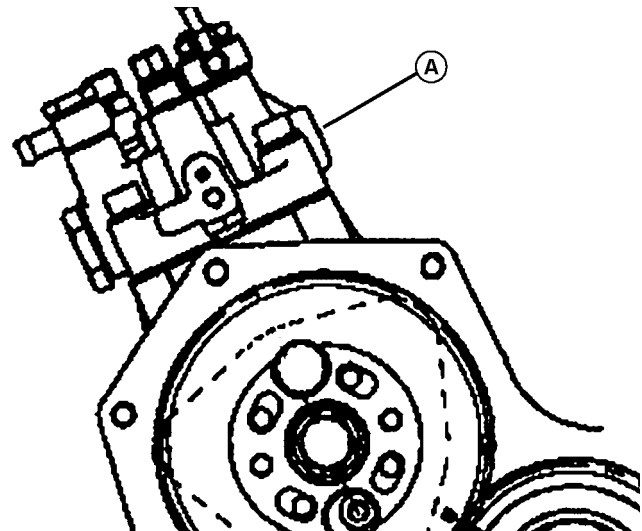
JDG10436 – TNV Diesel Engine Timing Tool Kit

Checking Fuel Injection Timing:

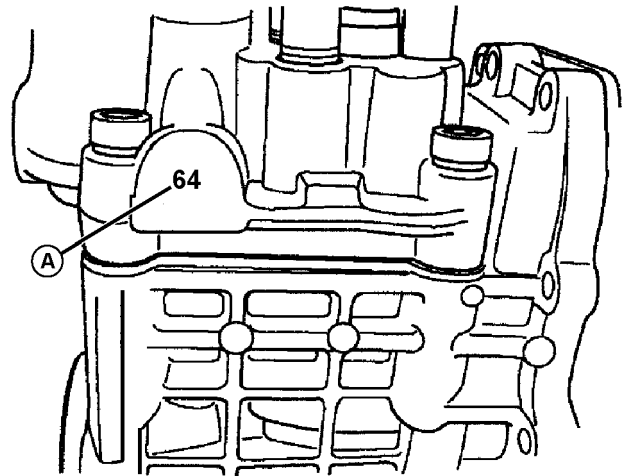
1. Locate and record the fuel injection pump timing index number stamped on the boss (A) of the engine side of the fuel injection pump housing. Treat this number as though there is a decimal point between the two digits. i.e. 64 = 6.4.
2. The Fuel Injection Reference (FIR) number for the 3720 is shown below. Record the number.

John Deere Model	Yanmar Engine Model	FIR (Fuel Injection Reference Number)
3720	3TNV84HT-BJT	4.5
3520	3TNV84T-BMJT	2.0
3320	3TNV88-BMJT	5.0

- Insert the numbers you have recorded into the following equation:



LVAL13903 —UN—14JAN11



LVAL13904 —UN—14JAN11

A—Timing Index Number Stamp

(Fuel Injection Pump Timing Index Number X2)
+ FIR Number = FIT° (Fuel Injection Timing in Degrees)

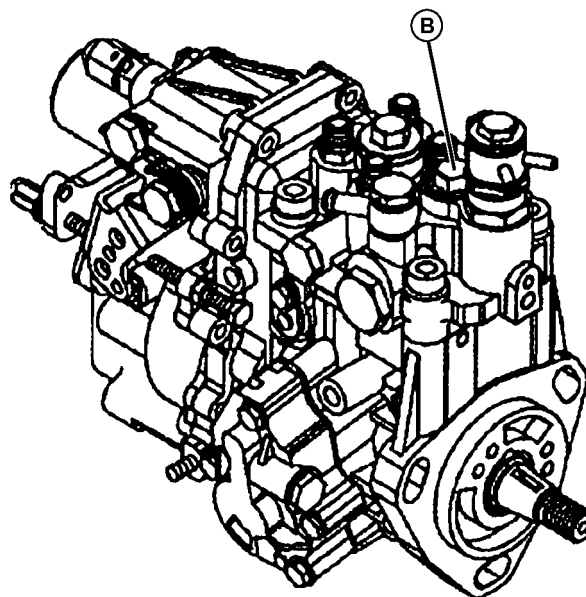
Numbers from the 3720 will be used for the example.

Example: Fuel Injection Pump Timing Index Number is 64. Add decimal point, number is now 6.4 X2 = 12.8 + FIR number of 4.5 = 17.3° FIT° (Fuel Injection Timing in Degrees) BTDC

Continued on next page

OUC1082,0005E8E -19-30NOV12-1/12

3. Turn off the fuel valve and clamp the fuel return hose shut.

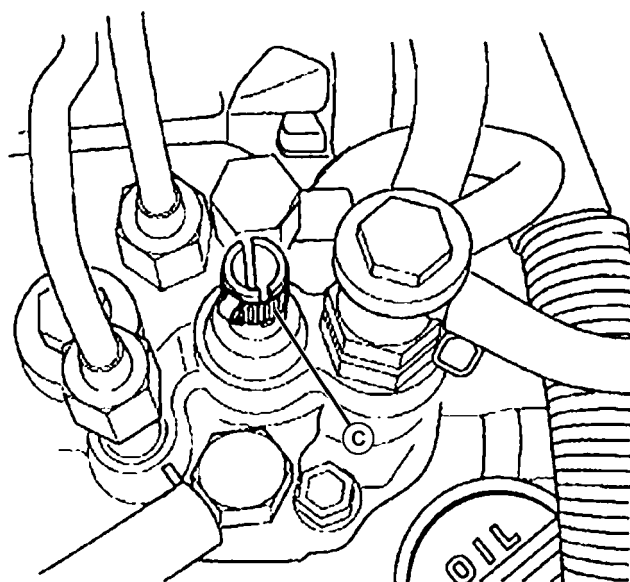


LVAL13905—UN—14JAN11

OUC1082,0005E8E -19-30NOV12-2/12

4. Clean the top of the injector pump to prevent dirt from entering the pump when plunger plug is removed. Remove the forward fuel injection pump plunger plug (B) on top of the fuel injection pump.

B—Plunger Plug



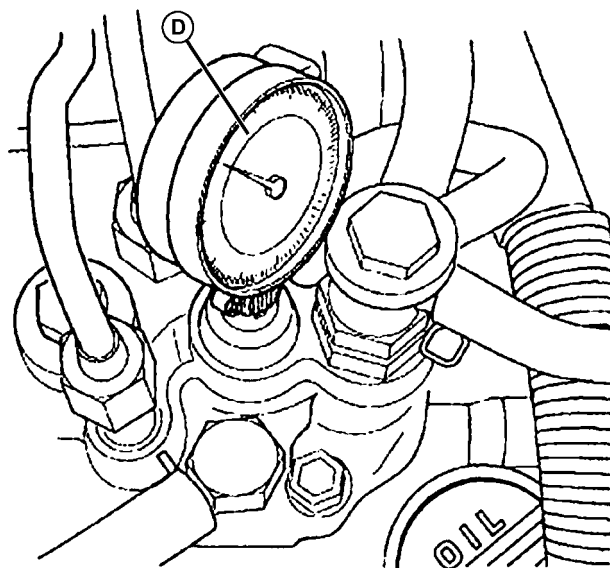
LVAL13906—UN—14JAN11

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OUC1082,0005E8E -19-30NOV12-3/12

5. Install a dial indicator adapter (C) and clamp from the JDG10436 timing tool kit into the pump plunger opening.

C—Dial Indicator Adapter

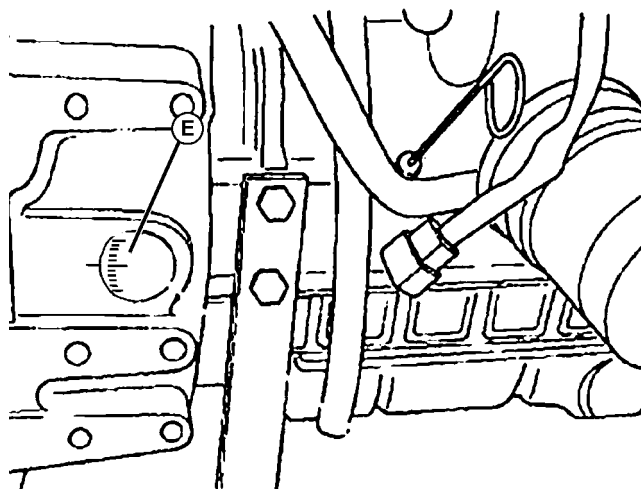


LVAL13907 —UN—14JAN11

OUO1082,0005E8E -19-30NOV12-4/12

6. Install the dial indicator (D) with extension into the adapter. Move the indicator up and down while watching the dial. When the dial gets to the midway point of travel, tighten clamp.

D—Dial Indicator



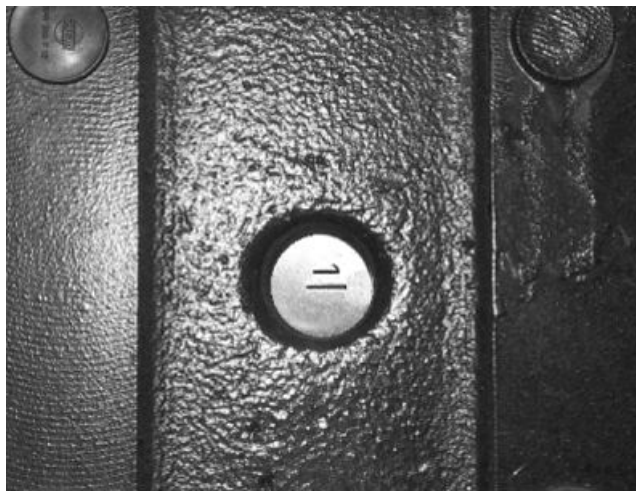
LVAL13908 —UN—14JAN11

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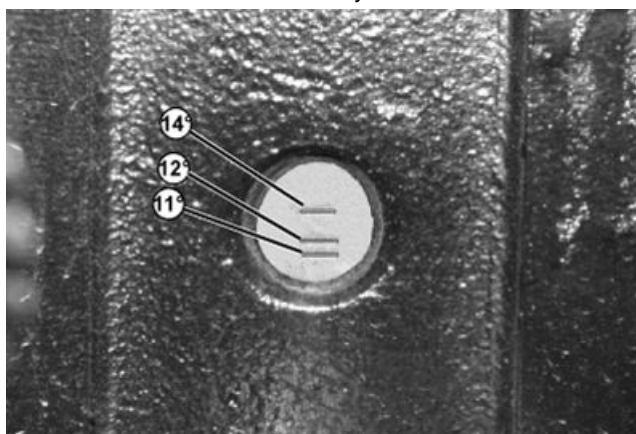
OUO1082,0005E8E -19-30NOV12-5/12

NOTE: The following references to rotating the crankshaft are from the coolant pump end of the engine and are adjusted by turning the crankshaft pulley.

7. Using a wrench on the crankshaft pulley bolt, rotate the crankshaft in a clockwise direction while looking through the flywheel inspection port (E).



Shows number 1 Cylinder TDC mark



Shows injection timing marks in degrees BTDC on engines up to May of 2008.

Continued on next page

OUC1082,0005E8E -19-30NOV12-6/12

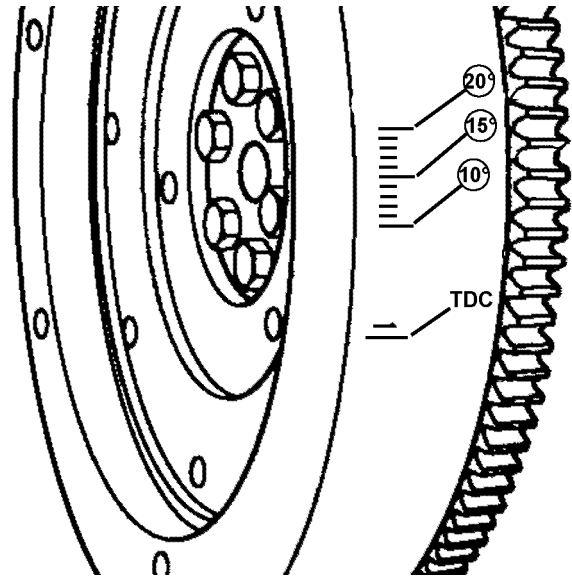
LVAL13909 —UN—14JAN11

LVAL13910 —UN—14JAN11

NOTE: A typical flywheel will have a timing mark grid for each cylinder. Any grid can be used to check the fuel injection timing. Flywheels on machines made after May 2008 shown in MX40499 above have marks for every degree from 10 to 20. On these flywheels highlight the calculated (target) timing mark and proceed to step 10.

Flywheels on machines made before May 2008 do not have marks for every degree. On the pre May 2008 flywheel shown in MX40481 the pair of marks above the TDC mark are 11 and 12° BTDC and the next mark up is 14°. As calculated earlier the timing should be 17.3° BTDC. Timing specs are to $\pm 1^\circ$ so if your calculation has a decimal point, round it up or down to the nearest degree. In this case round it down to 17°.

If the timing calculations on your engine do not coincide with the marks stamped in the flywheel you must determine where the calculated BTDC mark should be and mark the flywheel. This particular engine does not have a mark at 17° so you will have to determine where the 17° BTDC mark should be and place the mark on the flywheel. Timing marks are more easily accessed from bottom of flywheel housing. Turn the flywheel to access the marks. The 14° mark is shown below. One degree on the flywheel is 2.9 mm, so you need to add a mark (A) $3 \times 2.9\text{mm} = 8.7\text{mm}$ to the right of the 14° mark to be at 17° BTDC.



Shows injection timing marks in degrees BTDC on engines after May 2008

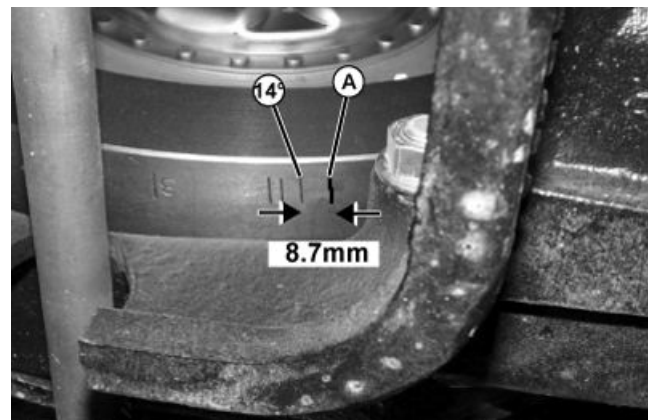
LVAL13911 —UN—14JAN11

8. Rotate the crankshaft until the injection timing marks are visible.

OUO1082,0005E8E -19-30NOV12-7/12

9. Highlight the target timing mark (A) on the flywheel.
10. Rotate the crankshaft counter clockwise until the dial indicator shows that the injection pump plunger is at the bottom of its stroke. Turn the crankshaft back and forth slightly to confirm a point where the dial indicator shows no movement. Zero the dial indicator.

A—Target Timing Mark



LVAL13912 —UN—14JAN11

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OUO1082,0005E8E -19-30NOV12-8/12

11. Slowly rotate the crankshaft clockwise until the dial indicator shows a pump plunger lift of 2.5 mm (0.098 in.).
12. Put a timing reference mark (B) at the center of the timing inspection hole in the flywheel housing.
13. Check the position of the flywheel target timing mark (C) in relation to the mark on the flywheel housing or engine backplate. If the two marks are aligned, the timing is correct. If the marks do not align, the fuel injection timing must be adjusted. Proceed to Step 1 under "Adjusting Fuel Injection Timing" below.
14. If the timing is correct, remove the dial indicator and adapter. Install the the plunger plug and copper gasket and tighten. Install the flywheel inspection port cover. Open fuel shutoff valve and remove clamp from fuel return line.
15. Prime the fuel system. Operate engine and check for leaks.

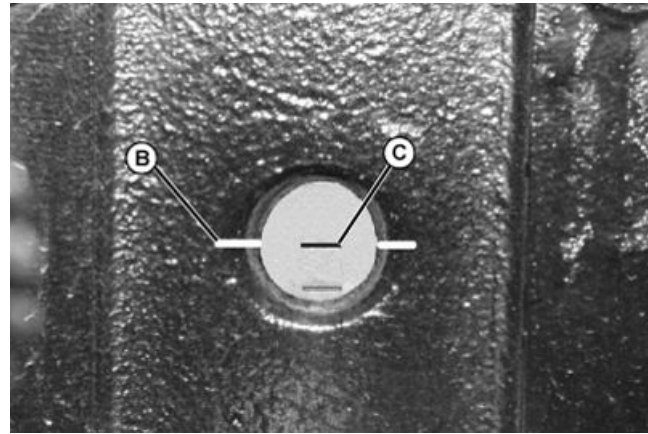
Adjusting Fuel Injection Timing:

1. Leave the dial indicator on the fuel injection pump. Make sure the dial still shows 2.5 mm (0.098 in.).
2. Rotate the flywheel until the target timing mark and the timing reference mark on the flywheel housing or backplate are aligned.
3. Note the reading on the dial indicator. If the reading is less than 2.5 mm (0.098 in.) the timing is retarded. If the dial indicator reading is greater than 2.5 mm (0.098 in.) the fuel injection timing is advanced.
4. Loosen the nuts fastening the fuel injection pump to the timing gear case or front plate.

NOTE: Some engine models may require the intake manifold and fuel injection pump insulator be removed to access the inner fuel injection pump retaining nuts.

5. Loosen the rear bracket(s) on on the fuel injection pump.

NOTE: Loosening the the high pressure injection line nuts on the fuel injection pump may make rotating the pump easier.



B—Timing Reference Mark

C—flywheel target timing mark

6. Rotate the fuel injection pump until the dial indicator reads 2.5 mm (0.098 in.). To advance timing, rotate top of injector pump away from the engine. To retard timing, rotate top of injector pump toward the engine.
7. When the dial indicator reads 2.5 mm (0.098 in.) of pump plunger lift and the target timing mark on the flywheel is aligned with the reference mark on the flywheel housing or engine backplate, the injection timing is correct.
8. Tighten the fuel injection pump mounting nuts and rear bracket(s).
9. Remove the dial indicator and adapter. Replace the plug and copper gasket in the pump plunger opening and tighten. If removed, install intake manifold and pump insulator. Tighten the high pressure injection line nuts to specification. Open fuel shutoff valve and remove clamp from fuel return line. Prime the fuel system. Operate engine and check for leaks.

Specification

Injector Line	
Nuts—Torque.....	30 - 35 N·m (22 - 25 lb ft)

Continued on next page

OUC1082,0005E8E -19-30NOV12-9/12

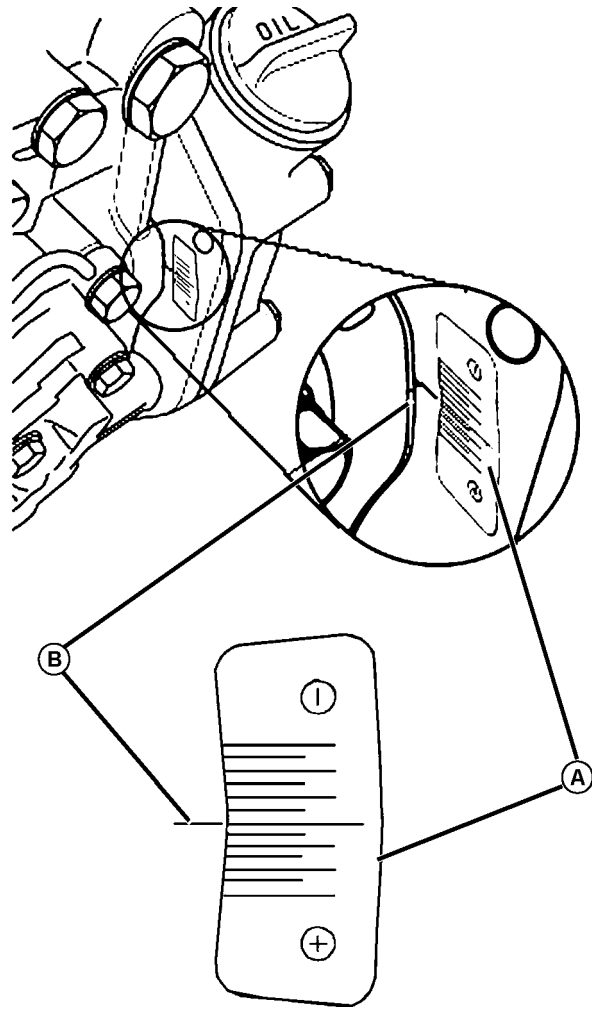
LVAL13913 —UN—14JAN11

Installing a New or Recalibrated Injector Pump:

1. Locate and record the timing index number on the replacement injector pump.
2. Install O-ring on injector pump.
3. Be sure to align marks on gears made during removal. Align key on injector pump shaft with keyway in gear while sliding injection pump onto back of gear cover mounting plate. Install three mounting nuts. Do not tighten.
4. Install nut on timing gear. Hold crankshaft pulley nut with wrench and tighten injector pump timing gear nut to specification.
5. Install the timing grid sticker (A) supplied with the replacement injector pump onto the back of the timing gear case aligning the center mark on the sticker with the mark (B) made on the gear case during disassembly.

A—Timing Grid Sticker

B—Center Mark



Continued on next page

OUO1082,0005E8E -19-30NOV12-10/12

LVAL13914 —UN—14JAN11

6. Calculate the difference between the calibration number (C) recorded off of the original pump and the number on the replacement pump.

- Whatever the calibration number is, treat it as if there were a decimal point between the two digits.
Example: 68 would be 6.8

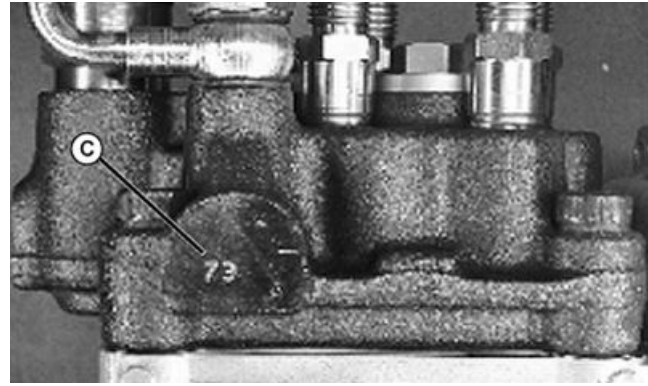
Calibration Number Example A	
Replacement Injection Pump =	7.3
Original Injection Pump =	6.8
Difference =	+0.5

- If the difference between the calibration numbers is a positive number, (the replacement pump number is higher than the original pump number), the injector pump mounting position must be advanced.

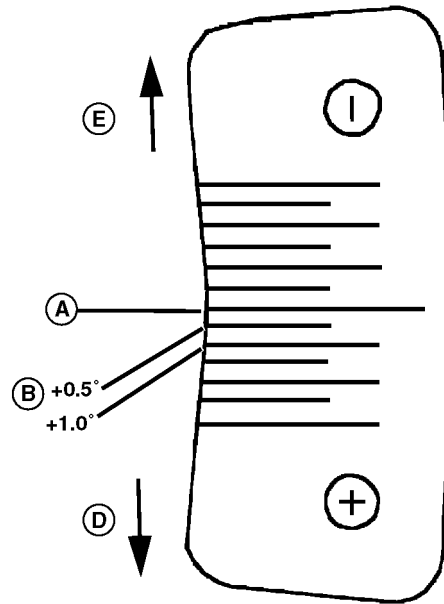
Calibration Number Example B	
Replacement Injection Pump =	7.3
Original Injection Pump =	7.8
Difference =	-0.5

- If the difference between the calibration numbers is a negative number, (the replacement pump number is lower than the original pump number), the injection pump position must be retarded.
- The rest of the the timing story will be using the calculation from example A.
- Each mark on the timing sticker represents 0.5° timing change.
- Long mark (A) in center of sticker represents 0°.
- The calibration number example A indicates that the replacement injector pump is to be installed at 0.5° advanced from the center mark (B) on the timing sticker.

7. Align the mark on the injector pump with the appropriate mark on the timing sticker and tighten injector pump retaining nuts to specification.
8. Install and tighten the injector pump rear support bracket.
9. Place a thin bead of John Deere form in place gasket on the cover, and install the cover.
10. Connect fuel shutoff solenoid wire.
11. Connect hoses to/from fuel filter.
12. Install the lower radiator hose and connect the coolant hoses to the cold start device.



A—Calibration Number



A—0° Long Mark
B—0.5° Advanced From the Center Mark

D—Advance
E—Retard

13. Install the external lube line. When installing the line, put one copper washer between the mounting bolt head and lube line and the other between the lube line and housing.
14. Fill cooling system with proper coolant.

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OUC1082,0005E8E -19-30NOV12-11/12

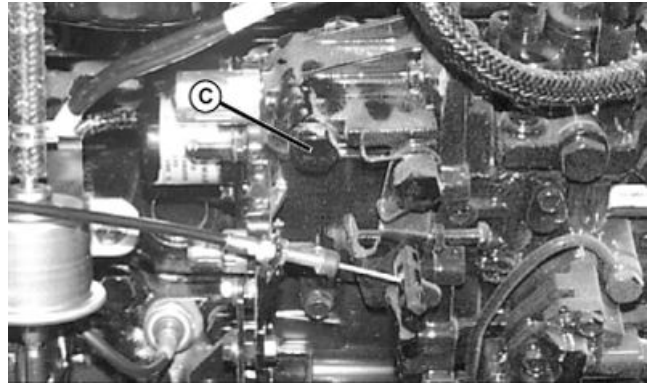
LVAL13915 —UN—14JAN11

LVAL15839 —UN—18APR11

IMPORTANT: Avoid Damage! When installing a new or repaired fuel injection pump it is important to add engine oil to the pump for lubrication during the initial start up of engine. Add 150-200 cc (5-7 oz) of new engine oil to the fuel injection pump before operating engine. Injector pump can be damaged if operated without the proper amount of oil.

15. Install fuel injection lines and tighten to specification.

Remove the fill plug (C) and add 150-200 cc (5-7 oz) of new engine oil to the governor housing. Reinstall fill plug.



C—Fill Plug

Specification

Injector Line	
Nuts—Torque.....	30 - 35 N·m (22 - 25 lb-ft)
Injector Pump Mounting	
Nuts—Torque.....	23 - 28 N·m (17-21 lb-ft)
Timing Gear	
Nut—Torque.....	78 - 88 N·m (58 - 65 lb-ft)

OUO1082,0005E8E -19-30NOV12-12/12

LVAL13917 —UN—14JAN11

Fuel Injection Nozzle Test

CAUTION: Avoid Injury! Escaping fluid under pressure can penetrate the skin causing serious injury. Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure. Search for leaks with a piece of cardboard. Protect hands and body from high-pressure fluids.

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable source. Such information is available from the Deere & Company Medical Department in Moline, Illinois, U.S.A.

Reason:

To determine opening pressure, leakage, chatter, and spray pattern of the fuel injection nozzle.

Equipment:

- D0110AA Adapter Set
- D01109AA Diesel Fuel Injection Nozzle Tester
- 23622 Straight Adapter
- Container

Connections:

IMPORTANT: Avoid Damage! Use clean filtered diesel fuel when testing injection nozzles for best results.

Connect the fuel injection nozzle (F) to D01109AA Diesel Fuel Injection Nozzle Tester (A) using parts 36352 (B), 23617 (C), 23621 (D) from D0110AA Adapter Set, and 23622 straight adapter (E).

Procedure 1:

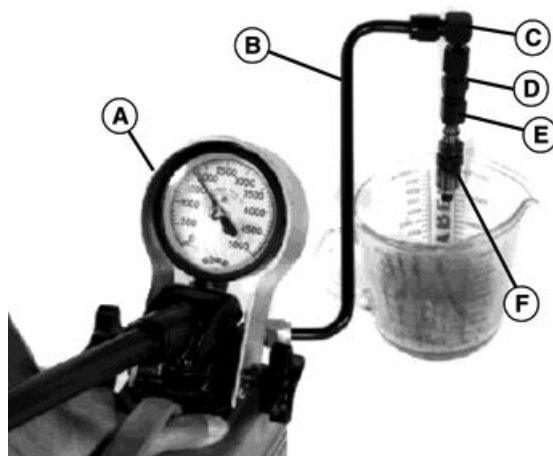
Test the fuel injection nozzle opening pressure following the Nozzle Tester manufacturer's instructions.

Results:

- If the pressure reading does not meet specification, disassemble the injection nozzle and inspect for contamination or a stuck valve. If necessary, add or remove shims to change opening pressure.

Specification

Fuel Injection	
Nozzle Opening	
Pressure—Pressure.....	19 600 + 1000 kPa
	(1960 ± 10 bar)
	(2843 ± 145 psi)



A—D01109AA Diesel Fuel Injection Nozzle Tester
B—36352 Hose
C—23617 Elbow Fitting

D—23621 Adapter
E—23622 Straight Adapter
F—Fuel Injection Nozzle

LVAL13757—UN—18NOV10

Procedure 2:

Test fuel injection nozzle leakage following the nozzle tester manufacturer's instructions.

1. Dry the nozzle completely using a lint-free cloth.
2. Pressurize the nozzle to **19 600 kPa (196 bar) (2843 psi)**.
3. Watch for leakage from nozzle spray orifice.

Results:

- Fuel should not leak from the nozzle when the nozzle is pressurized.
- If the injection nozzle leaks fuel, disassemble and inspect the nozzle assembly for contamination. Inspect the valve seating surface. Replace the nozzle assembly if necessary.

Procedure 3:

Test the fuel injection nozzle chatter and spray pattern following the nozzle tester manufacturer's instructions.

1. Pressurize nozzle to **19 600 kPa (196 bar) (2843 psi)**.
2. With slow hand lever movement there should be a "chatter" sound.

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OUC1023,0002ED1 -19-10FEB11-1/2

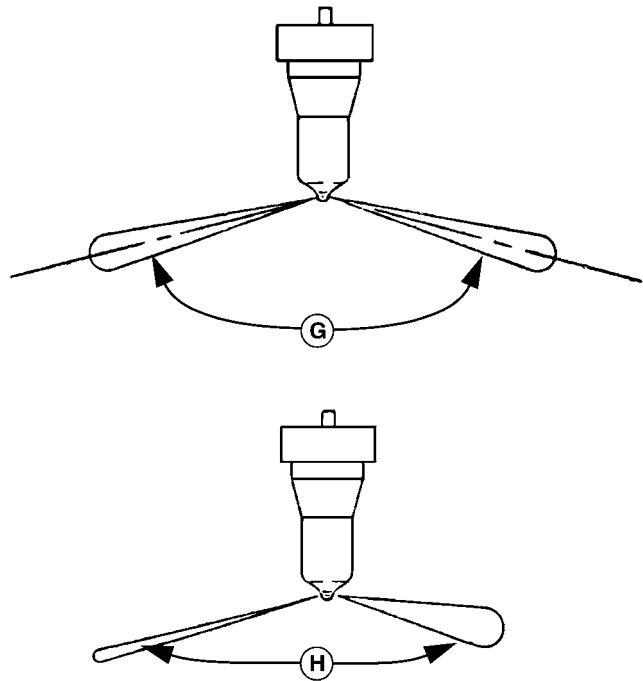
3. With fast hand lever movement the nozzle should exhibit an even, fine atomized spray pattern (G).
4. Place a sheet of white paper **30 cm (12 in.)** below the nozzle. The injection spray should form a perfect circle on the paper.

Results:

- If nozzle chatter or the spray pattern does not meet specifications, disassemble the injection nozzle and inspect the nozzle assembly for contamination. Inspect the valve seating surface. Replace the nozzle assembly if necessary.
- If there is a difference in the spray angle or injection angle (H), incomplete atomizing or sluggish starting/stopping of injection, disassemble the injection nozzle and inspect the nozzle assembly for contamination. Replace the nozzle assembly if necessary.

G—Fine, Atomized Spray Pattern

H—Injection Angle



OUO1023,0002ED1 -19-10FEB11-2/2

LVAL13758 —UN—18NOV10

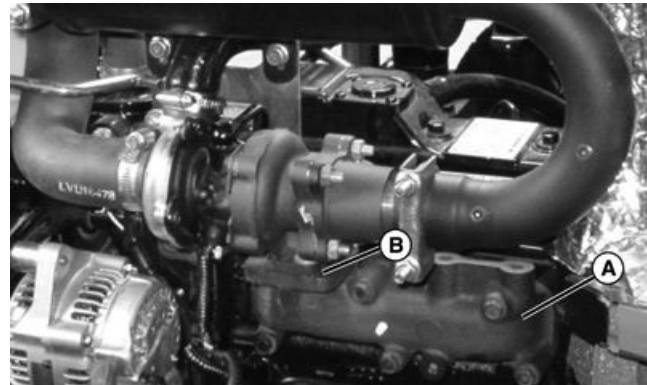
Check for Exhaust Air Leaks (Turbocharger)

Exhaust leaks, upstream of the turbocharger, will cause the turbocharger turbine to rotate at a reduced speed resulting in low boost pressure, low power, and excessive black smoke.

Inspect the exhaust manifold gaskets between manifold and cylinder head, the exhaust manifold, and the turbocharger gasket for damage and signs of black soot deposits (indicating leakage). Replace components as needed.

A—Exhaust Manifold

B—Turbocharger Gasket



Exhaust Leak Check

OUO1023,0002ED2 -19-10FEB11-1/1

LVAL13759 —UN—18NOV10

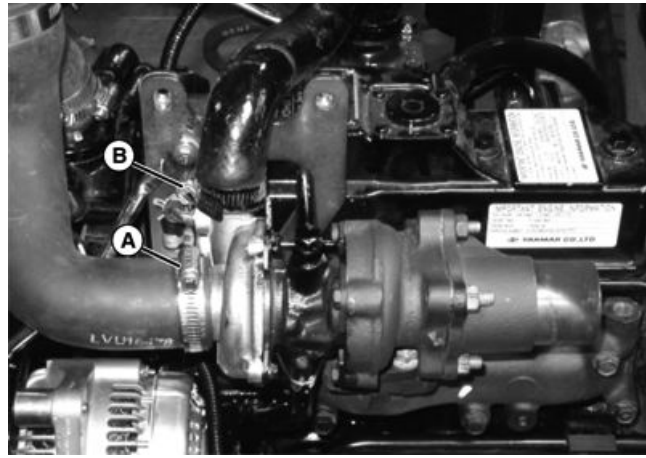
Turbocharger Oil Seal Leak Check

Seals are used on both sides of the turbocharger rotor assembly. The seals are used to prevent exhaust gasses and air from entering the turbocharger housing. Oil leakage past the seals is uncommon but can occur.

A restricted or damaged turbocharger oil return line can cause the housing to pressurize, causing oil to leak by the seals. Additionally, intake or exhaust restrictions can cause a vacuum between the compressor and turbocharger housing, causing oil to leak by the seals.

Procedure:

1. Park machine safely. (See Park Machine Safely in Section 10, Group 05.)
2. Allow engine to cool.
3. Raise hood.
4. Remove the muffler.
5. Loosen the hose clamps (A and B). Remove the inlet and outlet air hoses.



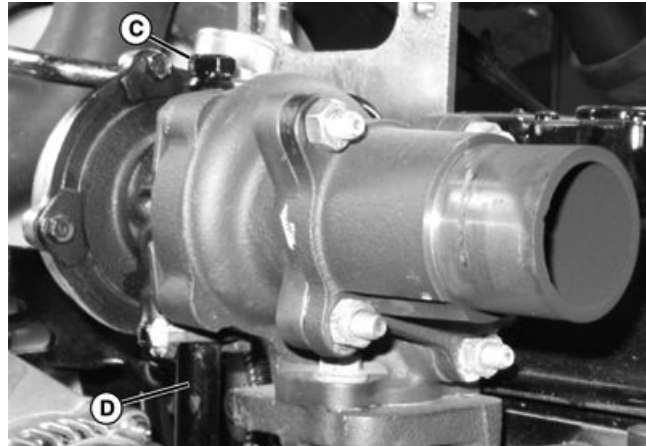
A—Hose Clamp

B—Hose Clamp

LVAL13760 —UN—18NOV10

OUO1023,0002ED3 -19-10FEB11-1/2

6. Inspect the turbine casing and inlet line (C) for evidence of oil leakage.
If oil leakage is present, perform the following:
 - a. Inspect turbocharger oil return line (D) for kinks or damage. Replace if necessary.
 - b. Check the air intake filter, hoses, and inlet hose for restrictions.
 - c. Check the exhaust system for restrictions to include position of exhaust outlet.
7. Perform necessary repairs and repeat test.



C—Inlet Line

D—Oil Return Line

LVAL13761 —UN—18NOV10

OUO1023,0002ED3 -19-10FEB11-2/2

Turbocharger Waste Gate Test

Equipment:

- Pressure regulating valve—Allowing gradual adjustment in a range from 0—200 kPa (0—29 psi).

Procedure:

1. Park machine safely. (See Park Machine Safely in Section 10, Group 05.)
2. Allow engine to cool.
3. Raise hood.
4. Check hose to waste gate actuator for kinks or cracks. Replace if damaged.

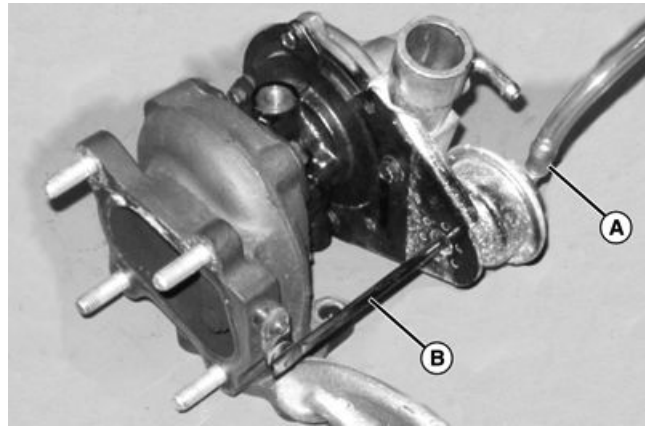
5. Disconnect hose from waste gate actuator (A).
6. Connect a regulated air source to actuator fitting.

IMPORTANT: Avoid Damage! Do not apply more than 400 kPa (58 psi) to the actuator.

7. Vary pressure to waste gate actuator from 0—193 kPa (0—1.93 bar) (0—20 psi). Check results below.
8. Apply 117 kPa (1.17 bar) (17 psi) to actuator, shut off and seal air supply. Wait one minute and measure pressure in actuator.

Results:

- Actuator rod (B) should move in and out freely as pressure is varied.



A—Waste Gate Actuator

B—Actuator Rod

- If rod does not move freely, disconnect turbocharger waste gate linkage. Check for movement and repair or replace components as necessary.
- After 117 kPa (1.17 bar) (17 psi) is applied, the pressure should not drop below 103 kPa (1.03 bar) (15 psi) after one minute. Replace actuator if pressure drop exceeds specification.

LVAL13762 —UN—18NOV10

OUC1023,0002ED4 -19-10FEB11-1/1

Turbocharger Inspection

The following inspection procedure is recommended for systematic failure analysis of a suspected failed turbocharger. This procedure will help to identify when a turbocharger has failed, and why it has failed so the primary cause of the failure can be corrected.

Proper diagnosis of a non-failed turbocharger is important for two reasons. First, identification of a turbocharger that has not failed will lead to further investigation and repair of the cause of the complaint.

Proper diagnosis also eliminates the expense incurred when a non-failed turbocharger is replaced.

The recommended inspection steps, which are explained in detail on following pages, are:

- Compressor Housing Inlet and Compressor Wheel.
- Compressor Housing Outlet.
- Turbine Housing Inlet.
- Turbine Housing Outlet and Turbine Wheel.
- External Center Housing and Joints.

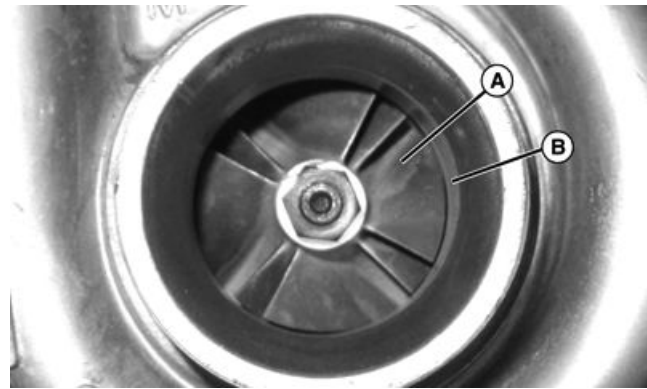
NOTE: To enhance the turbocharger inspection, an inspection sheet (Form No. DF-2280 available from Distribution Service Center—English only) can be used that lists the inspection steps in order and shows potential failures for each step. Check off each step as you complete the inspection. Record any details or problems obtained during inspection. Retain this with the work order for future reference.

- Perform Axial End Play Test

Compressor Housing Inlet and Compressor Wheel:

NOTE: Foreign object damage may be extensive or minor. The source of the foreign object must be found and corrected to eliminate further damage.

1. Check compressor inlet and compressor wheel (A) for foreign object damage.



A—Compressor Wheel

B—Housing

2. Mark findings on your checklist and continue the inspection.

NOTE: You will need a good light source for this check.

3. Check compressor inlet for wheel rub on the housing (B). Look closely for score marks on the housing itself. Check the tips of the compressor wheel blades for damage.

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OUO1023,0002ED5 -19-10FEB11-1/9

Compressor Housing Outlet:

1. Check compressor housing outlet (A). The outlet should be clean and free of dirt or oil.
2. Mark it on your checklist if dirt or oil is found and continue the inspection.

A—Compressor Housing Outlet



LVAL13764 —UN—18NOV10

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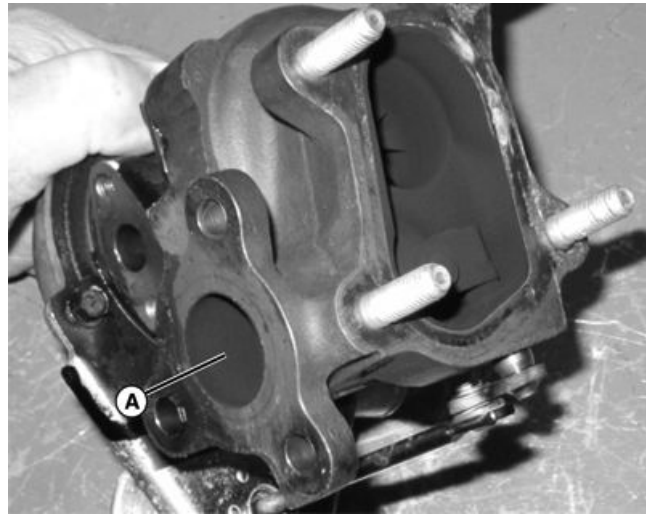
OUO1023,0002ED5 -19-10FEB11-2/9

Turbine Housing Inlet:

NOTE: If the inlet is wet with oil, or has excessive carbon deposits, an engine problem is likely.

Check the turbine housing inlet (A) for oil in housing, excessive carbon deposits.

A—Turbine Housing Inlet



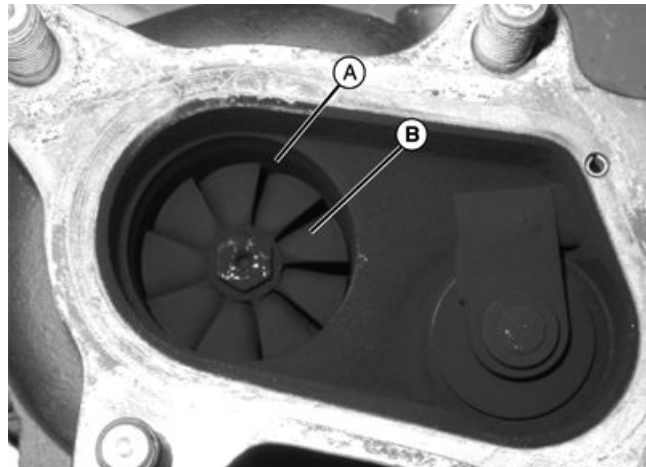
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OUO1023,0002ED5 -19-10FEB11-3/9

Turbine Housing Outlet and Turbine Wheel:

1. Use a flashlight to look up inside the turbine housing outlet (A). Check blades (B) for foreign object damage.

A—Turbine Housing Outlet B—Blades

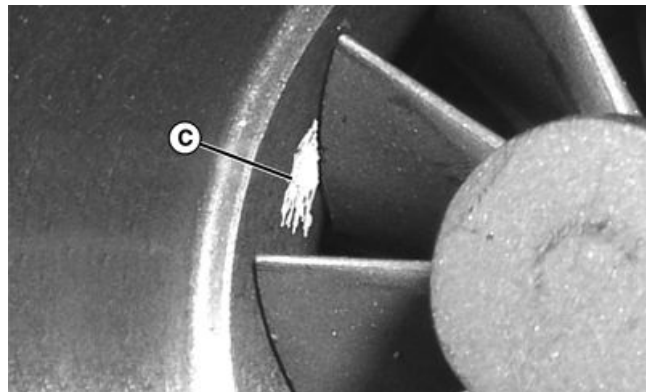


LVAL13766 —UN—18NOV10

OUO1023,0002ED5 -19-10FEB11-4/9

2. Inspect the wheel blades and housing for evidence of wheel rub (C). Wheel rub can bend the tips of the blades with the housing showing wear or damage.

C—Wheel Rub



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OUO1023,0002ED5 -19-10FEB11-5/9

3. Rotate the shaft (D), using both hands, to check rotation and clearance. The shaft should turn freely, however there may be a slight amount of drag.

IMPORTANT: Avoid Damage! Use only moderate hand force (3-4 pounds) on each end of shaft.

NOTE: There will be some "play" because the bearings inside the center housing are free floating.

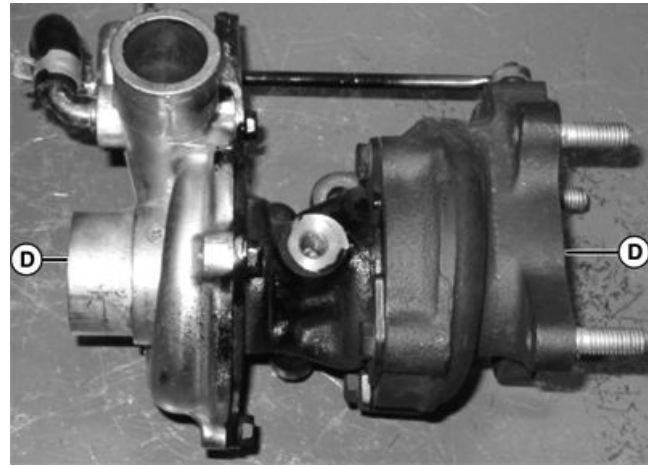
4. Next, pull up on the compressor end of the shaft and press down on the turbine end while rotating shaft. Neither the compressor wheel nor the turbine wheel should contact the housing at any point.

External Center Housing and Joints

IMPORTANT: Avoid Damage! Before you conclude that the turbocharger has not failed, check the radial bearing clearance and axial bearing end play with a dial indicator. These procedures are not required if a failure has already been identified.

NOTE: If oil is present, make sure that it is not coming from a leak at the oil supply or return line.

Visually check the outside of the center housing, all connections to the compressor, and turbine housing for oil.



D—Shaft

Rotor Play Test:

This test will give an indication of the condition of the thrust bearing within the center housing and rotating assembly.

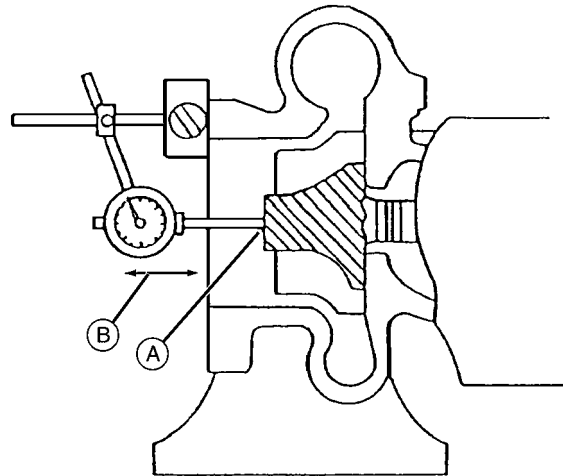
Axial Direction:

OUO1023,0002ED5 -19-10FEB11-6/9

1. Mount magnetic base dial indicator so that indicator tip (A) rests on flat surface on turbine end of shaft. Preload indicator tip and zero the indicator dial.
2. Move shaft axially (B) back and forth by hand.
3. Observe and record total dial indicator movement. If bearing end play is not within specification, replace the turbocharger.

Specification

Rotor Play—Axial	
Direction—Play.....	0.022—0.053 mm (0.001—0.002 in.)
Rotor Play Wear	
Limit—Axial	
Direction—Play.....	0.07 mm (0.007 in.)



A—Indicator Tip

B—Direction of Axial Play

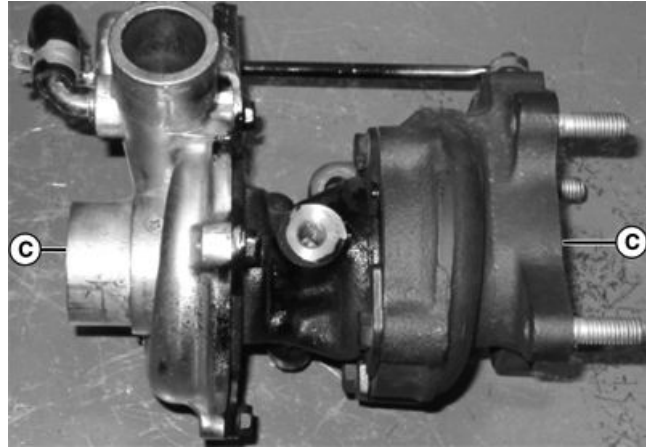
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OUO1023,0002ED5 -19-10FEB11-7/9

4. Next, check shaft end play by moving the shaft (C) back and forth while rotating. There will be some end play but not to the extent that the wheels contact the housings.

Radial Direction

C—Shaft



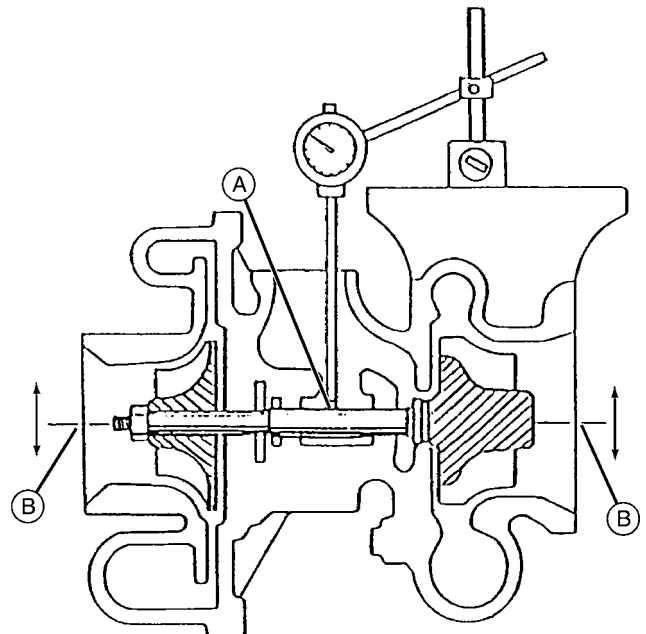
LVAL13770 —UN—18NOV10

OUO1023,0002ED5 -19-10FEB11-8/9

1. Mount magnetic base dial indicator so that indicator tip (A) enters the center housing through the oil drain port and rests on the turbine shaft. Preload indicator tip. Zero dial on indicator.
2. Move both ends of the shaft (B) radially up and down by hand at the same time.

NOTE: These diagnostic procedures allow you determine the condition of the turbocharger. If the turbocharger has failed, analysis of your inspection notes should direct you to the specific areas of the engine to correct the problems causing the turbocharger failure. It is not unusual to find that a turbocharger has not failed. If your turbocharger passes the inspections, the problem lies elsewhere.

3. Observe and record total dial indicator movement. If turbine shaft radial play is not within specification, install a replacement turbocharger.



Rotor play in radial direction

A—Indicator Tip

B—Shaft

LVAL13771 —UN—18NOV10

Item	Measurement	Specification
Rotor Play—Radial Direction	Play	0.061—0.093 mm (0.002—0.004 in.)
Rotor Play Wear Limit—Radial Direction	Play	0.12 mm (0.005 in.)

OUO1023,0002ED5 -19-10FEB11-9/9

Crankshaft End Play Check

Reason:

To determine the clearance between the crankshaft and the engine block.

Equipment:

- Dial Indicator

Procedure:

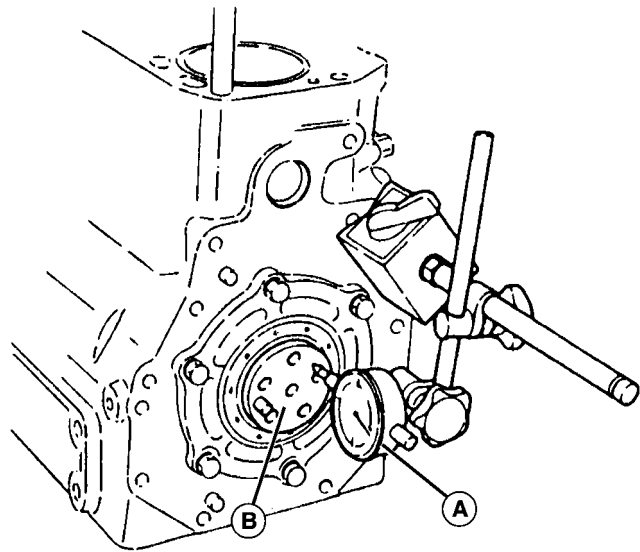
NOTE: Crankshaft end play can be measured at either end of crankshaft. Procedure is performed from the rear end. The flywheel is removed to show detail.

1. Fasten the dial indicator (B) to engine and position indicator tip on end of crankshaft (A).

IMPORTANT: Avoid Damage! Do not use excessive force when moving crankshaft to avoid damaging bearings.

2. Push the crankshaft toward rear as far as possible.
3. Zero the dial indicator.
4. Using a bar, gently pry the crankshaft as far forward as possible.
5. Check crankshaft end play to ensure that it is within specification.

Specification	
Crankshaft—End Play.....	0.13—0.23 mm (0.005—0.009 in.)



A—Dial Indicator

B—End of Crankshaft

LVAL13772—UN—18NOV10

Results:

- If the end play exceeds specification, replace the thrust bearings.

Specification	
Crankshaft—Wear	
Limit—End Play.....	0.28 mm (0.011 in.)

OUC1023,0002ED6 -19-10FEB11-1/1

Timing Gear Backlash Check

Reason:

To check for wear between meshing gears, resulting in excessive noise and poor engine performance.

Equipment:

- Dial Indicator

Procedure:

1. Measure the backlash between meshing gears.
2. The backlash for all gears EXCEPT the hydraulic pump gear is **0.07—0.15 mm (0.003—0.006 in.)**.

Specification	
Timing Gear	
Backlash—All Except	
Hydraulic Pump	
Gear—Backlash.....	0.07—0.15 mm (0.003—0.006 in.)

3. The backlash for the hydraulic pump gear is **0.11—0.19 mm (0.004—0.008 in.)**.

Specification	
Hydraulic Pump	
Gear—Backlash.....	0.11—0.19 mm (0.004—0.008 in.)

Results:

- If the backlash exceeds specifications, replace meshing gears as a set:
- Idler Gear, Camshaft Gear, Crankshaft Gear, Hydraulic Pump Gear AND/OR Idler Gear, Fuel Injection Pump Gear.

OUC1023,0002ED7 -19-10FEB11-1/1

Camshaft End Play Check

Reason:

To determine proper side clearance between camshaft gear end journal and thrust plate.

Equipment:

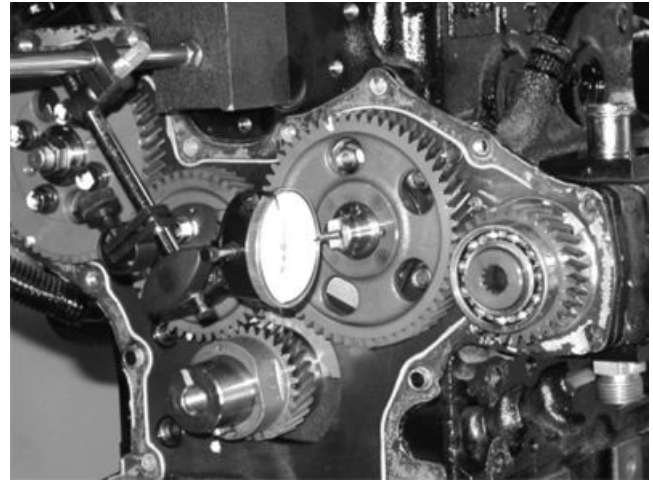
- Dial Indicator

Procedure:

1. Remove the timing gear cover. (See [Timing Gear Cover](#) in Section 30, Group 30.)
2. Fasten the dial indicator to the engine. Position indicator tip on end of camshaft.
3. Push the camshaft toward the rear as far as possible.
4. Zero the dial indicator.
5. Pull the camshaft forward as far as possible.
6. Standard end play is **0.05—0.20 mm (0.002—0.008 in.)**.

Specification

Camshaft—End Play.....0.05—0.20 mm
(0.002—0.008 in.)



LVAL13773 —UN—18NOV10

Results:

- If the end play exceeds **0.30 mm (0.012 in.)**, remove the camshaft and replace the thrust plate.

Specification

Camshaft Wear
Limit—End Play..... 0.30 mm
(0.012 in.)

OUO1023,0002ED8 -19-10FEB11-1/1

Connecting Rod Side Play Check

Reason:

To determine proper side clearance between the crankshaft and the connecting rod.

Equipment:

- Feeler Gauge

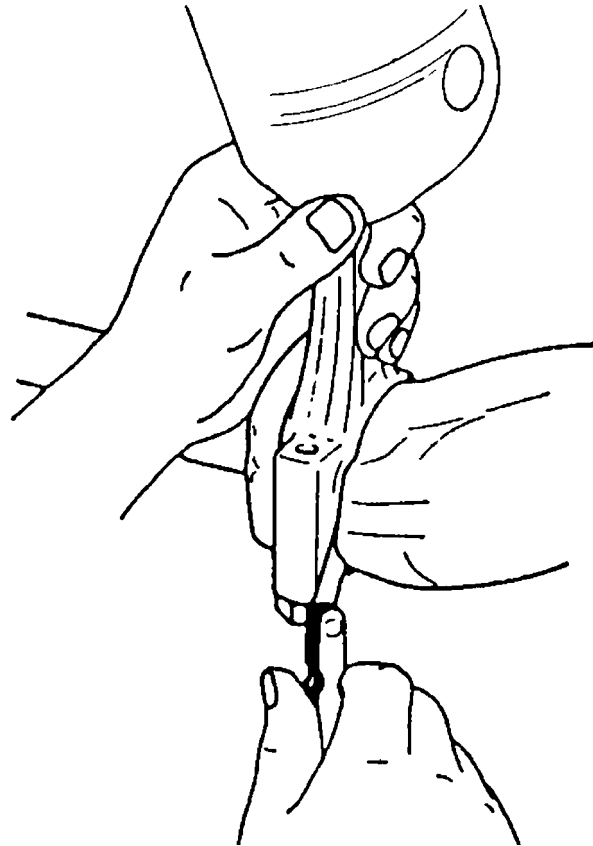
NOTE: The engine must be removed from the machine to perform this test.

Procedure:

1. Remove the oil pan, and oil pick-up.
2. Insert a feeler gauge, according to specifications, between the connecting rod cap and the crankshaft.
3. Connecting rod side play is **0.2—0.4 mm (0.008—0.016 in.)**.

Specification

Connecting Rod Side
Play—Play.....0.2—0.4 mm
(0.008—0.016 in.)



LVAL13774 —UN—18NOV10

Results:

- If the side play exceeds specification, replace the bearing inserts or the connecting rod.

OUO1023,0002ED9 -19-10FEB11-1/1

Connecting Rod Bearing Clearance Check

Reason:

To measure oil clearance between connecting rod bearing and crankshaft journal.

Equipment:

- Plastigage®

Procedure:

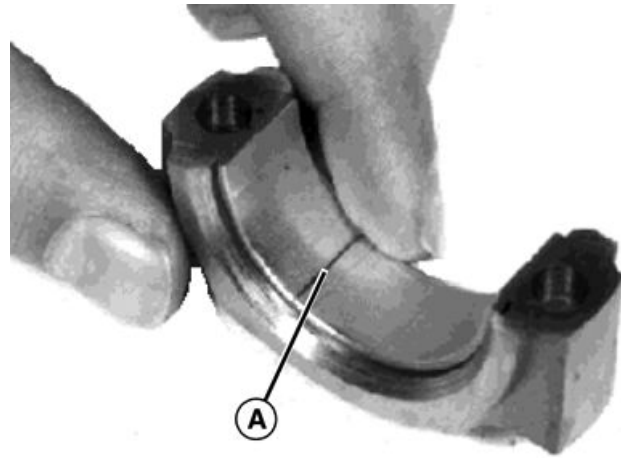
NOTE: The engine must be removed from the machine to perform this procedure.

1. Remove the oil pan, and oil pickup.

IMPORTANT: Avoid Damage! The connecting rod caps must be installed on the same connecting rod and in the same direction to prevent crankshaft and connecting rod damage.

2. Remove the connecting rod cap.
3. Wipe oil from the bearing insert and the crankshaft journal.
4. Put a piece of Plastigage® (A), or equivalent, along the full length of the bearing insert approximately **6 mm (0.25 in.)** off center.

Plastigage is a trademark of Perfect Circle Corporation



LVAL13775—UN—18NOV10

5. Turn the crankshaft approximately 30° from bottom dead center.
6. Install the connecting rod end cap and original rod bolts. Tighten the rod bolts to specification.

Specification

Rod Guide Bolt—Torque..... 44—49 N·m
(33—36 lb.-ft.)

7. Remove the rod bolts and the connecting rod cap.

NOTE: The flattened Plastigage (B) will be on either the bearing insert or crankshaft journal.

8. Use the graduation marks on the envelope (C) to compare the width of the flattened Plastigage (B) at its widest point. The number within the graduation marks indicates the bearing clearance in inches or millimeters depending on which side of the envelope is used.
9. Measure the connecting rod bearing oil clearance.

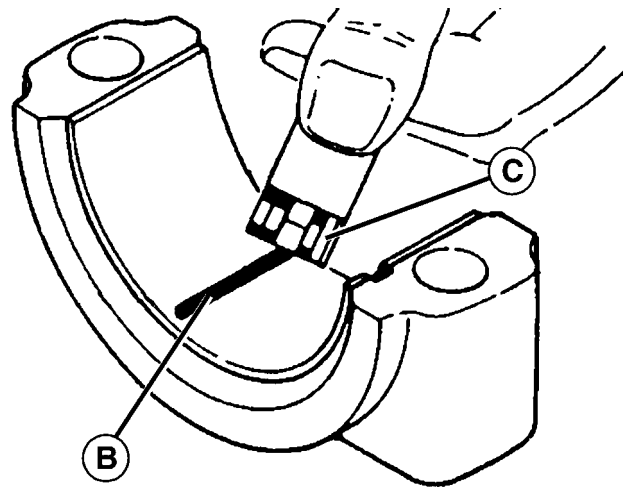
Specification

Connecting Rod
Bearing—Oil Clearance..... 0.04—0.07 mm
(0.002—0.003 in.)

Connecting Rod
Bearing—Wear
Limit—Oil Clearance..... 0.16 mm
(0.006 in.)

Results:

- If the clearance exceeds the wear limit specification, replace the bearing inserts.



B—Plastigage

C—Envelope

- Remove the Plastigage.

LVAL13776—UN—18NOV10

OUO1023,0002EDA -19-10FEB11-2/2

Crankshaft Main Bearing Clearance Check

Reason:

To measure oil clearance between main bearing and crankshaft journal.

Equipment:

- Plastigage®

Procedure:

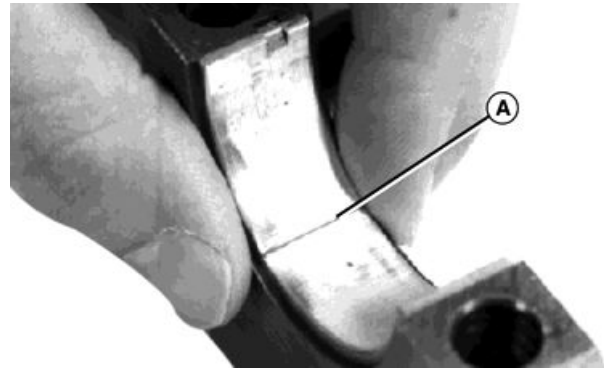
NOTE: The engine must be removed from the machine to perform this test.

1. Remove the oil pan, and oil pickup.

IMPORTANT: Avoid Damage! Main bearing caps must be installed on the same main bearing and in the same direction to prevent crankshaft and main bearing damage.

2. Remove the main bearing cap.
3. Wipe oil from the bearing insert and the crankshaft journal.
4. Put a piece of Plastigage (A), or equivalent, along the full length of the bearing insert approximately **6 mm (0.25 in.)** off center.

Plastigage is a trademark of Perfect Circle Corporation



A—Plastigage

5. Install the main bearing cap and bolts. Tighten the bolts to specification.

Specification

Main Bearing	
Bolt—Torque.....	91—98 N·m (68—72 lb.-ft.)

6. Remove the bolts and main bearing caps.

NOTE: The flattened Plastigage (B) will be on either the bearing insert or crankshaft journal.

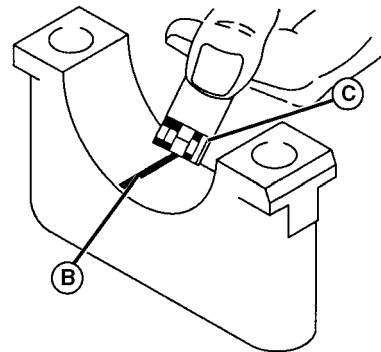
7. Use the graduation marks (C) on the envelope to compare the width of the flattened Plastigage at its widest point. The number within the graduation marks indicates the bearing clearance in inches or millimeters, depending on which side of the envelope is used.

Specification

Main Bearing—Oil	
Clearance.....	0.04—0.07 mm (0.002—0.003 in.)
Main Bearing—Wear	
Limit—Oil Clearance.....	0.16 mm (0.006 in.)

Results:

- If the clearance exceeds the wear limit specification, replace the bearing inserts.



B—Plastigage

C—Graduation Marks

- Remove Plastigage.

LVAL13777 —UN—18NOV10

OUO1023,0002EDB -19-10FEB11-1/2

LVAL13778 —UN—03DEC10

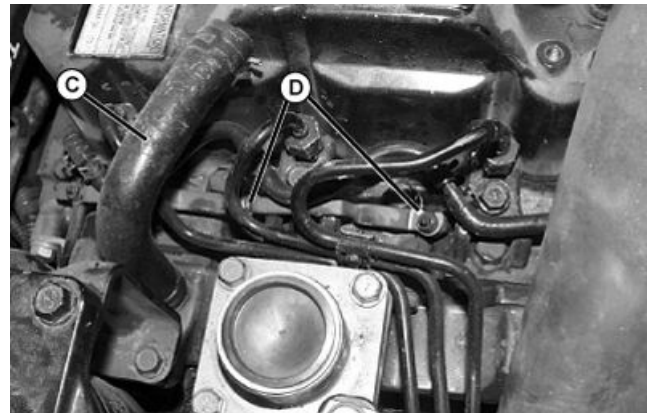
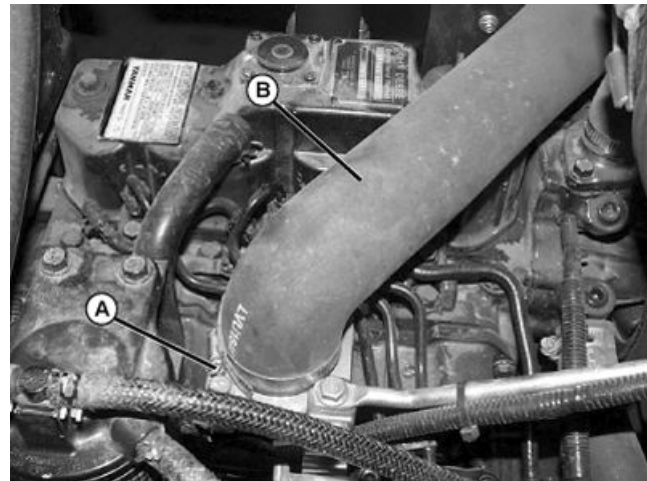
OUO1023,0002EDB -19-10FEB11-2/2

Glow Plug Removal and Installation (If Equipped)

1. Park machine safely.
2. Open hood and disconnect negative battery cable.
3. Loosen hose clamp (A). Disconnect air intake hose (B) and cover intake opening.
4. Make sure top of engine is as clean as possible. Pressure wash and/or blow off dirt with compressed air.
5. Disconnect breather hose (C) and plug openings to prevent dirt from getting into engine.
6. Loosen the nuts (D) several turns on all glow plugs. The nuts do not need to be removed.
7. Disconnect the glow plug wire (E) and slide connector bar (F) off of glow plugs.
8. Remove glow plug(s).

Installation:

- Install glow plugs in the reverse order of removal and tighten to specification.



A—Hose Clamp
B—Air Intake Hose
C—Breather Hose

D—Nuts
E—Glow Plug Wire
F—Connector Bar

Item	Measurement	Specification
Specification:		
Glow Plug		15 - 20 N·m (133 - 177 lb-in.)
Glow Plug Connector Nut		1 - 1.5 N·m (9 - 13 lb-in.)

OUO1023.0002EDC -19-10FEB11-1/1

LVAL13918 —UN—14JAN11

LVAL13919 —UN—14JAN11

Radiator Removal and Installation

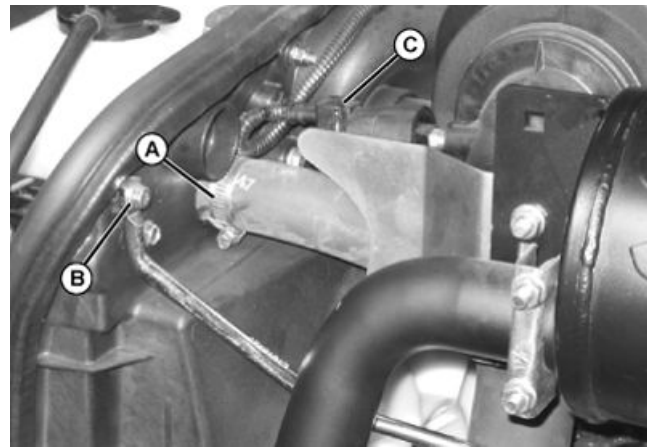
⚠ CAUTION: Avoid Injury! The radiator may be hot and can burn skin. Built-up pressure may cause explosive release of coolant when the radiator cap is removed:

- Shut off the engine and allow to cool.
- Do not remove the cap unless the radiator and the engine are cool enough to touch with bare hands.
- Slowly loosen the cap to the first stop to release all pressure, then remove cap.

1. Park machine safely. See Parking Safely in the Safety Section.
2. Raise hood. Secure with prop rod.
3. Allow engine to cool before servicing cooling system.
4. Open radiator cap.

NOTE: Cooling system capacity is approximately 5.3 L(5.6 qt).

5. Using a suitable container, drain coolant. Coolant drain plug is located on the engine side of the radiator in the lower left corner.
6. Disconnect upper radiator hose (A).



A—Upper Radiator Hose
B—Cap Screw

C—Air Restriction Sensor

7. Remove cap screw (B) from radiator support rod.
8. Disconnect the wire harness from the air restriction sensor (C).
9. Disconnect air restriction sensor wire harness from radiator fan shroud and route to the right side of engine away from radiator.

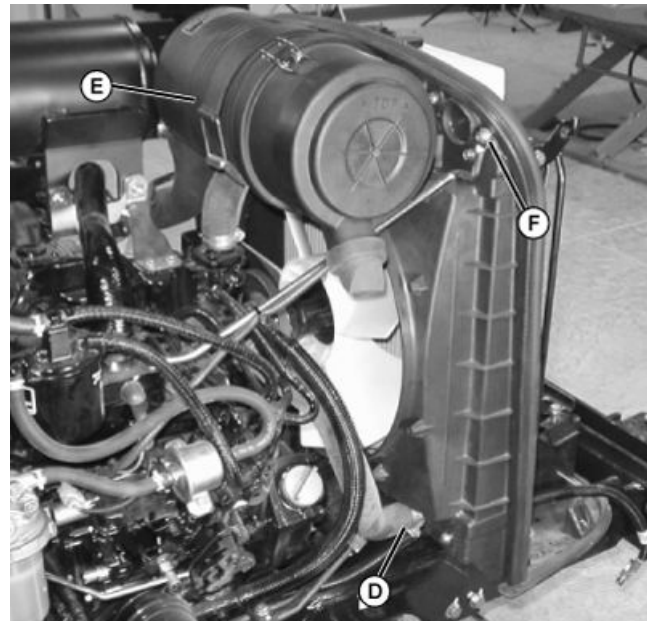
OUO1023.0002EDD -19-10FEB11-1/6

LVAL13921 —UN—14JAN11

10. Disconnect lower radiator hose (D).
11. Remove air intake hose at turbocharger. Remove air cleaner assembly (E).
12. Remove cap screw (F) from radiator support rod.

D—Lower Radiator Hose
E—Air Cleaner Assembly

F—Cap Screw



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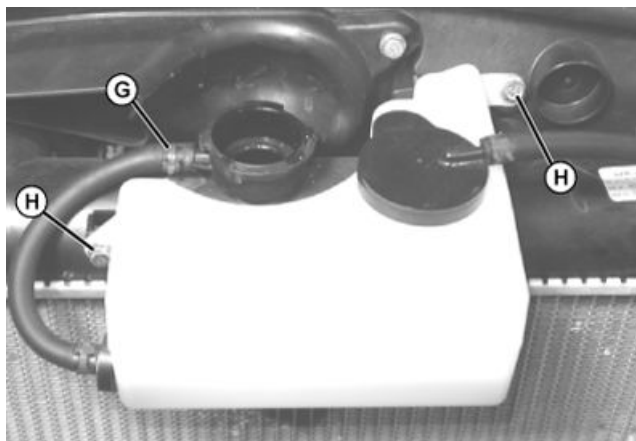
OUO1023.0002EDD -19-10FEB11-2/6

LVAL13922 —UN—14JAN11

13. Remove the recovery tank line (G) from the filler neck.
14. Remove two cap screws (H). Remove recovery tank. Pour the coolant in the recovery tank into the drain container.

G—Recovery Tank Line

H—Cap Screws (2)

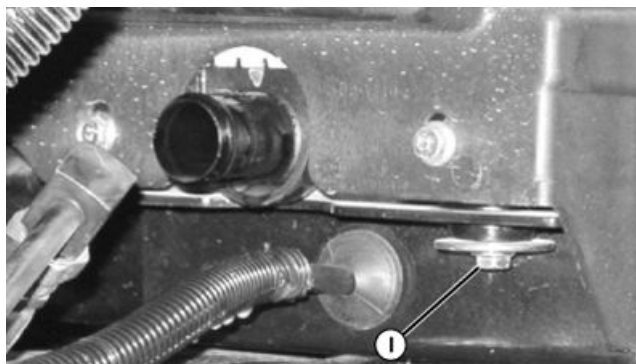


LVAL13923—UN—14JAN11

OUO1023,0002EDD -19-10FEB11-3/6

15. Remove the two lower radiator mounting cap screws and washers (I).

I—Cap Screws and Washers

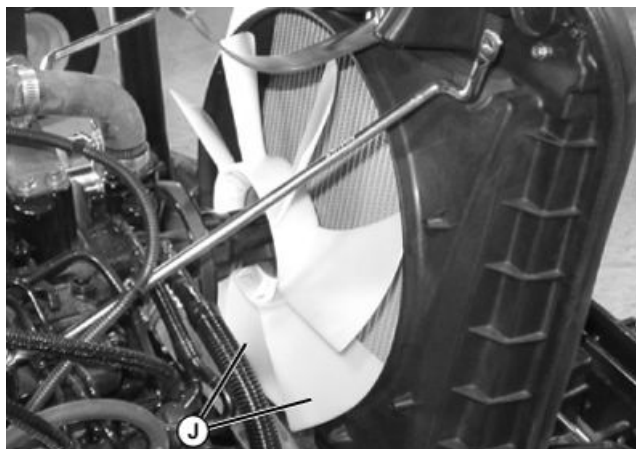


LVAL13924—UN—14JAN11

OUO1023,0002EDD -19-10FEB11-4/6

16. Tip the radiator forward. Carefully flex the fan blades (J) to allow the radiator and shroud to be removed.

J—Fan Blades



LVAL13925—UN—14JAN11

Continued on next page

OUO1023,0002EDD -19-10FEB11-5/6

17.

CAUTION: Avoid Injury! Reduce compressed air to less than 210 kPa (30 psi) when using for cleaning purposes. Clear area of bystanders, guard against flying chips, and wear personal protection equipment including eye protection.

Remove the eight cap screws (K) and remove the fan shroud from the radiator.

18. Check radiator for debris lodged in fins. Clean radiator using compressed air or pressure washer.

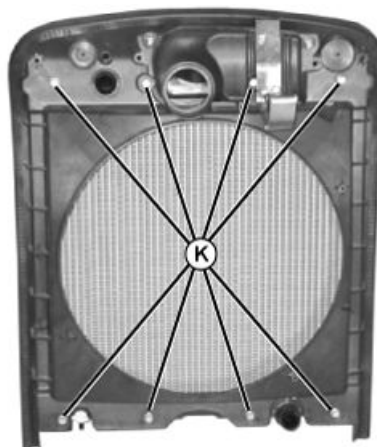
19. Inspect radiator for bent fins, cracks and damaged seams. Repair as necessary.

Installation:

1. Install radiator in the reverse order of removal.
2. Close drain valve. Fill radiator with proper coolant to top of filler neck.
3. Fill coolant reservoir between the full cold and full hot marks.
4. Start engine and allow it to reach proper operating temperature. Check radiator, hoses and connections

K—Cap Screws (8)

for leaks. Allow engine to cool, then check and adjust coolant level in recovery tank as needed.



LVAL13926—UN—14JAN11

OUO1023,0002EDD -19-10FEB11-6/6

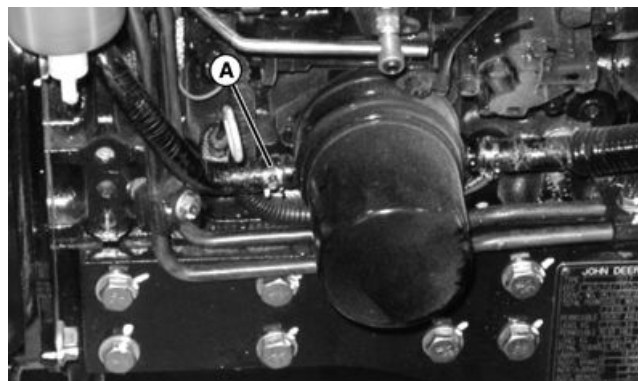
Thermostat Removal and Installation

Removal

1. Park machine safely. See Parking Safely in the Safety Section.
2. Raise hood. Secure with prop rod.
3. Allow engine to cool before servicing the cooling system.
4. Open radiator cap.

NOTE: Cooling system capacity is approximately 5.3 L (5.6 qt.).

5. Using a suitable container, drain coolant.
 - a. Radiator drain plug is located on the engine side of the radiator in the lower left corner.
 - b. Engine block is drained at the oil cooler. Remove the coolant hose (A) at the oil filter. Route the hose into a container to drain the engine block.
6. Disconnect the wire harness from the air restriction sensor.



Open station model shown.

A—Coolant Hose

7. Remove air intake hose at turbocharger. Remove air cleaner assembly.
8. Loosen clamp. Remove upper radiator hose from thermostat housing.

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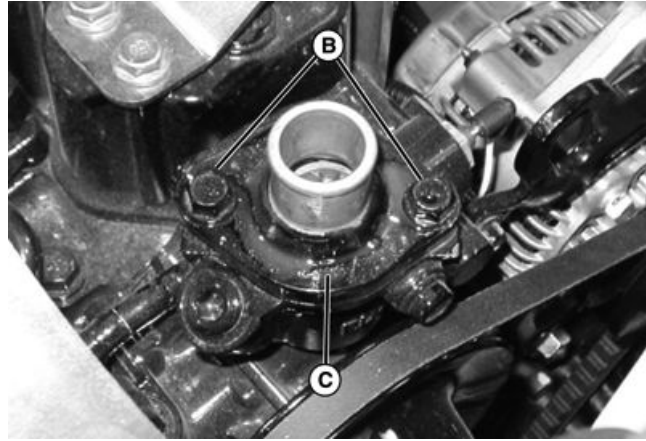
OUO1023,0002EDE -19-10FEB11-1/3

LVAL13779—UN—18NOV10

9. Remove two cap screws (B) holding thermostat housing to water pump. Remove housing (C).

B—Cap Screw (2 used)

C—Housing



Open station model shown.

LVAL13780—UN—18NOV10

OUO1023,0002EDE -19-10FEB11-2/3

10. Remove thermostat (D).

NOTE: *Thermostat is offset and only fits in one direction. Make sure that it is installed as shown and fits down in recess.*

11. Test or replace thermostat. Install thermostat with spring facing down.

12. Replace gasket. Tighten cap screws to specification..

Specification

Cap Screw-to-
Thermostat—Torque..... 18 N·m
(160 lb.-in.)

13. Close drain valve. Fill radiator with proper coolant to top of filler neck.

14. Fill coolant reservoir between the full cold and full hot marks.

15. Start engine. Allow it to reach proper operating temperature. Check radiator, hoses, and connections



Open station model shown.

LVAL13781—UN—18NOV10

D—Thermostat

for leaks. Allow engine to cool, then check and adjust coolant level in recovery tank as needed.

OUO1023,0002EDE -19-10FEB11-3/3

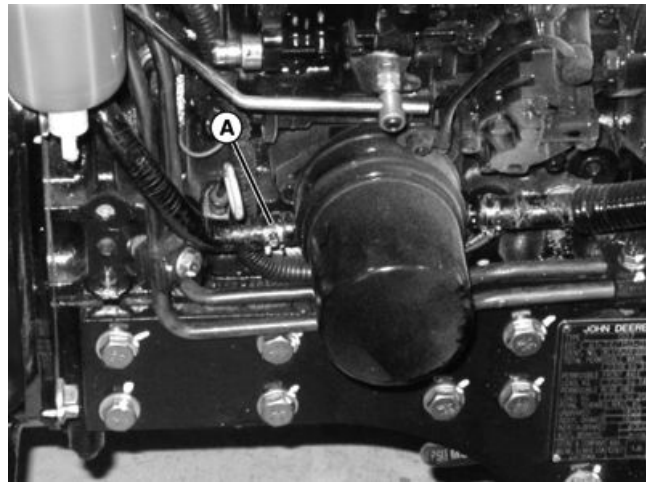
Water Pump Removal and Installation

Removal:

1. Park machine safely. See Parking Safely in the Safety Section.
2. Raise hood.
3. Allow engine to cool before servicing cooling system.
4. Open radiator cap.

NOTE: Cooling system capacity is approximately 5.3 L (5.6 qt.).

5. Drain the coolant using a suitable container.
 - Radiator drain plug is located on the engine side of the radiator in the lower left corner.
 - Engine block is drained at the oil cooler. Remove the coolant hose (A) at the oil cooler and route the hose into a container to drain the engine block.
6. Remove the radiator and shroud. (See Radiator Removal and Installation in Section 30, Group 25.)
7. Loosen alternator mounting bolts. Remove water pump/alternator drive belt.



A—Coolant Hose

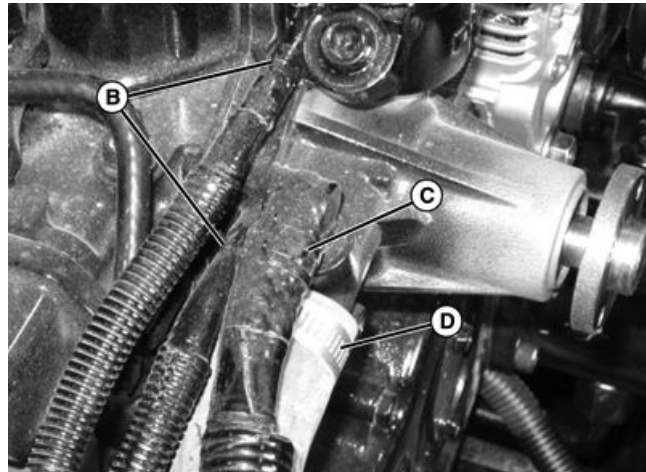
8. Remove four cap screws. Remove fan and sheave.

OUO1023,0002EDF -19-10FEB11-1/4

LVAL13782—UN—18NOV10

9. Remove the upper and lower cold start advance coolant hoses (B), oil cooler hose (C), and lower radiator hose (D).

B—Upper and Lower Cold Start Advance Coolant Hoses
C—Oil Cooler Hose
D—Lower Coolant Hose



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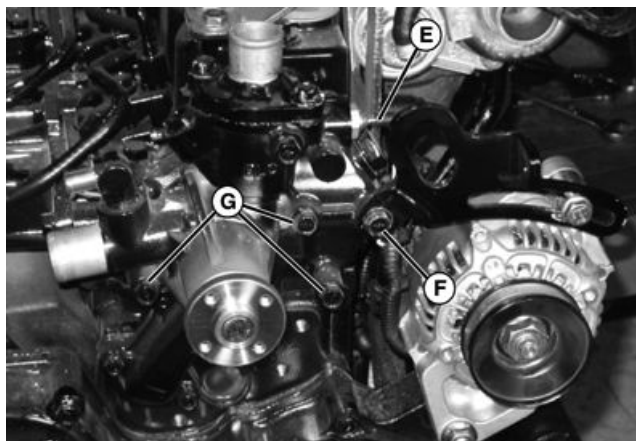
OUO1023,0002EDF -19-10FEB11-2/4

LVAL13783—UN—18NOV10

10. Disconnect coolant temperature switch lead (E). Remove switch from water pump if pump is to be replaced.
11. Remove alternator bracket cap screw (F). Pivot alternator clear of the water pump.
12. Remove the remaining water pump mounting cap screws (G), pump and gasket.
13. Inspect all parts for wear or damage.
14. Clean cylinder block mating surfaces of all old gasket material.

E—Coolant Temperature
Switch Lead
F—Cap Screw

G—Cap Screws

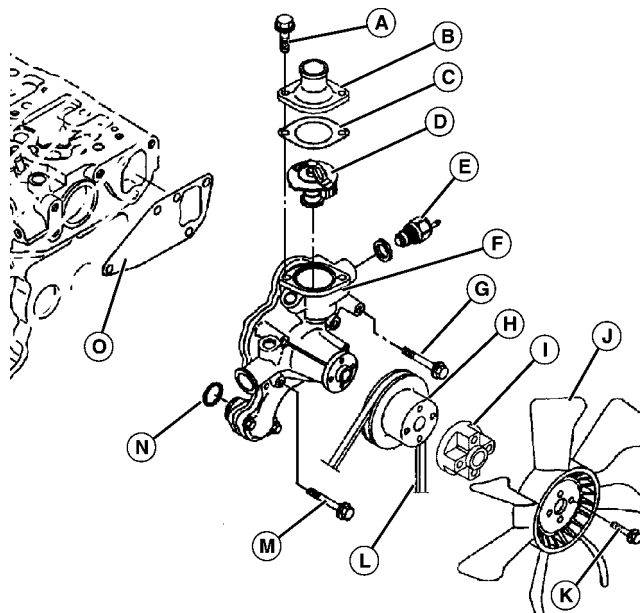


LVAL13784—UN—18NOV10

OUO1023,0002EDF -19-10FEB11-3/4

Inspection:

1. Inspect the water pump for coolant leakage. If the origin of the leak cannot be determined, test the cooling system. (See Cooling System Pressure Test in Section 30, Group 25.)
 - a. If coolant is leaking at the pulley flange: The shaft seal is defective. Replace the water pump.
 - b. If coolant is leaking between the cylinder head and the pump housing: The gasket between the head and the pump is defective. Remove the water pump. Replace the gasket.
2. Inspect the water pump for a worn bearing shaft.
 - Remove the fan belt and check for movement of the fan. Replace the water pump if fan movement is excessive.
 - If the bearing shaft is making noise when operating: Check the fan belt tension. If adjustment does not relieve the noise, the bearing shaft is defective. Replace the water pump.



LVAL13785—UN—18NOV10

Installation:

1. Installation is the reverse of removal.
2. Adjust water pump/alternator drive belt tension.
3. Close drain valve. Fill radiator to top of filler neck with proper coolant.
4. Fill coolant reservoir between the full cold and full hot marks.
5. Start engine. Allow it to reach proper operating temperature. Check radiator, hoses, and connections

A—Cap Screw, M8 x 20
B—Thermostat Cover
C—Gasket
D—Thermostat
E—Temperature Switch
F—Water Pump
G—Cap Screw, M8 x 60
H—Pulley

I—Spacer
J—Fan
K—Cap Screw, M6 x 55
L—Fan Belt
M—Cap Screw, M8 x 55
N—O-ring
O—Gasket

for leaks. Allow engine to cool, then check and adjust coolant level in recovery tank as needed.

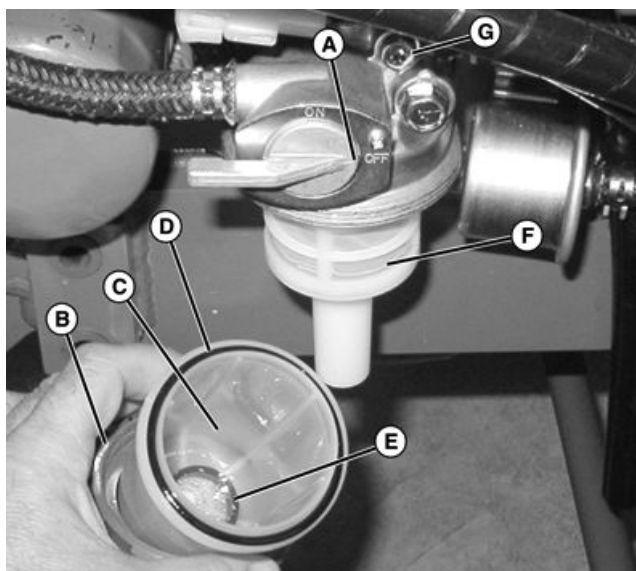
OUO1023,0002EDF -19-10FEB11-4/4

Fuel Filter/Water Separator 3TNV

1. Turn fuel shutoff valve (A) OFF . Open drain valve on bottom of filter bowl. Turn air bleed screw (G) out a few turns to drain fuel from bowl.
2. Remove retaining ring (B) and bowl (C). Inspect O-ring (D) and water indicator ring (E). Replace if damaged.
3. Remove strainer (F). Clean screen with clean fuel and low pressure compressed air. Replace strainer if damaged.

IMPORTANT: Avoid Damage! Tighten only enough to keep the filter assembly from leaking. Overtightening the retaining nut may damage the filter cover or retaining ring.

4. Clean all parts. Assemble in the reverse order of disassembly.
5. Turn on fuel valve and open air bleed screw (G) if not already open. When fuel bowl is full and a steady stream of fuel without air bubbles is coming out of air bleed screw, close bleed screw.



A—Fuel Shutoff Valve
B—Retaining Ring
C—Bowl
D—O-ring

E—Water Indicator Ring
F—Strainer
G—Air Bleed Screw

LVAL13786—UN—18NOV10

OUO1023,0002EE0 -19-10FEB11-1/1

Secondary Fuel Filter 3TNV

1. The secondary filter is a spin on filter. Remove the filter.
2. Fill new filter. Lubricate gasket with clean fuel.
3. Install new filter per instructions printed on filter.
4. Turn key switch ON. Let electric fuel pump run for 30 seconds to purge air from filter and lines.
5. Start machine and check for leaks.



LVAL13787—UN—18NOV10

OUO1023,0002EE1 -19-10FEB11-1/1

Fuel Injection Pump

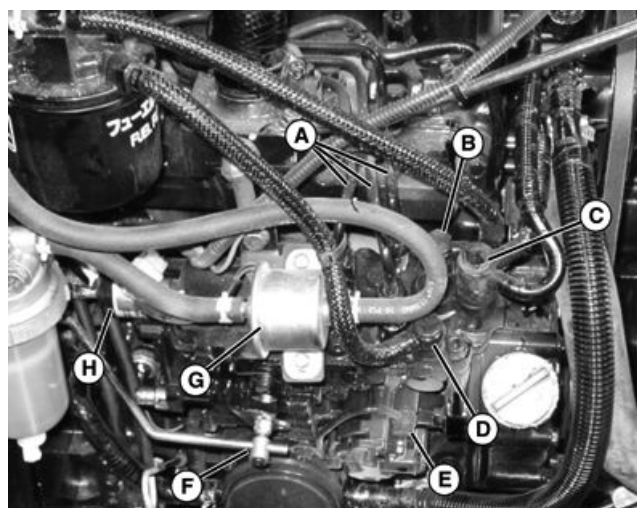
Removing:

CAUTION: Avoid Injury! Escaping fluid under pressure can penetrate the skin causing serious injury. Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure. Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluids.

If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable source. Such information is available from the Deere & Company Medical Department in Moline, Illinois, U.S.A.

IMPORTANT: Avoid Damage! Never steam clean or pour cold water on an injection pump while the pump is running or warm. Doing so can damage the pump.

1. Park machine safely. (See Park Machine Safely in Section 10, Group 05.)
2. Raise hood and secure with a prop rod.
3. Allow engine to cool before attempting to service cooling system.
4. Remove the radiator and shroud. (See Radiator Removal and Installation in Section 30, Group 25.)
5. Clean the injection pump lines and area around the pump using parts cleaning solvent or steam cleaner.
6. Loosen the fuel injection line nuts. When loosening the nuts on the injection pump, use another wrench to keep the delivery valves from loosening.
7. Loosen line clamps. Remove the fuel injection lines (A).



Open station model shown.

- | | |
|----------------------------|-------------------------|
| A—Fuel Injection Lines | E—External Lube Line |
| B—Hose | F—Throttle Linkage |
| C—Cold Start Advance Hoses | G—Fuel Pump |
| D—Fuel Filter Hoses | H—Fuel Shutoff Solenoid |

8. Remove the leak off hose (B).
 9. Remove the cold start advance hoses (C).
 10. Remove the fuel filter hoses (D).
 11. Remove the external lube line (E).
 12. Disconnect the throttle linkage (F).
- NOTE: It is not necessary to remove the pump line from the fuel pump.*
13. Remove the cap screws securing the fuel pump (G) to the injection pump. Move the fuel pump clear of the injection pump.
 14. Remove the fuel shutoff solenoid (H).

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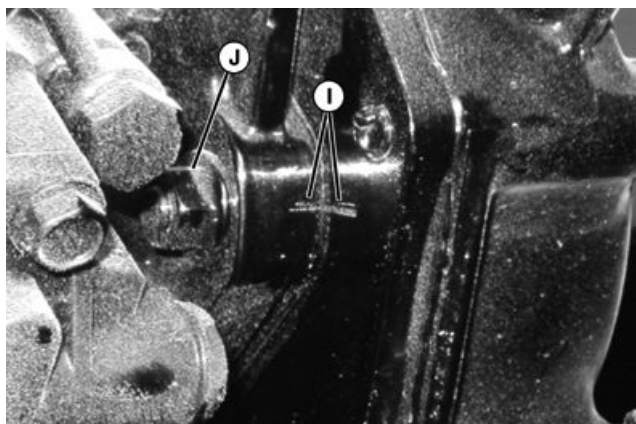
OUO1023,0002EE2 -19-15FEB11-1/5

LVAL13788—UN—18NOV10

15. Note the position of the timing marks (I) on the injection pump and the gear cover mounting plate.
16. Remove three mounting nuts (J).
17. Remove the access cover from the front of the timing gear cover.

I— Timing Marks

J— Mounting Nut (2 used)



LVAL13789 —UN—18NOV10

OUO1023,0002EE2 -19-15FEB11-2/5

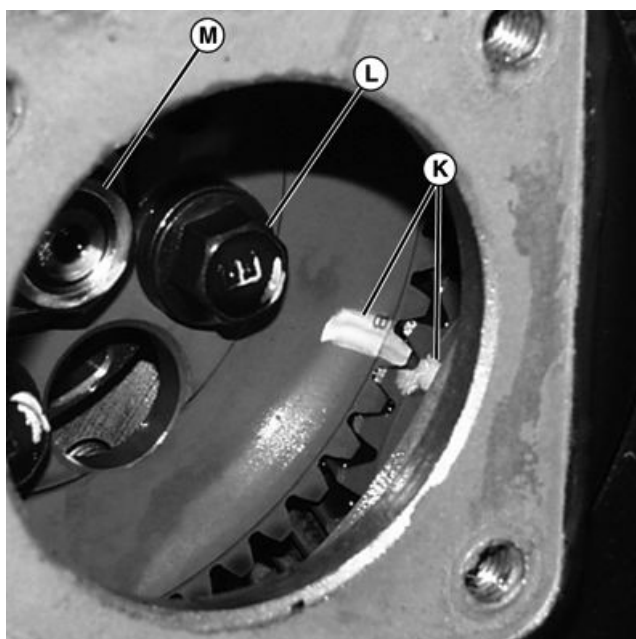
18. Rotate engine until "B" marks on injection pump gear and idler gear (K) are aligned.

IMPORTANT: Avoid Damage! DO NOT loosen four cap screws (L) attaching gear to hub! This gear/hub assembly times the injection pump camshaft in relation the crankshaft for precise timing of EPA engines. This procedure is done at the pump manufacturing plant and cannot be duplicated in the field!

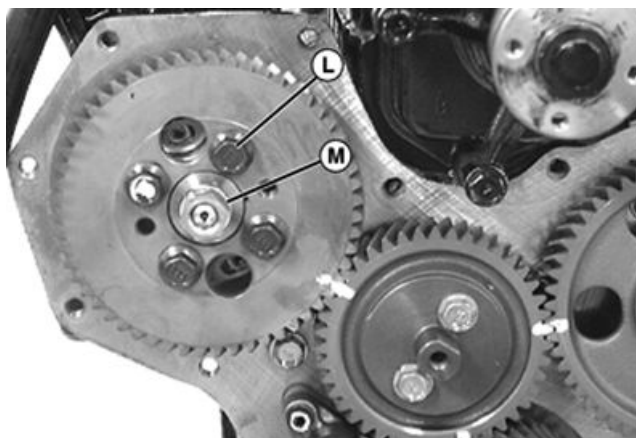
19. Remove nut (M).

K—Idler Gear
L—Cap Screws

M—Nut



LVAL13790 —UN—18NOV10



LVAL13791 —UN—18NOV10

Timing gear cover removed for photo only. Timing gear cover does not need to be removed for injection pump removal.

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OUO1023,0002EE2 -19-15FEB11-3/5

20. Use a puller to remove the gear from the injection pump shaft. Remove the puller. The gear remains in the timing gear cover.

IMPORTANT: Avoid Damage! DO NOT attempt to service the injection pump or governor. If unit is in need of repair, it must be serviced by a qualified fuel injection repair shop. If replacement is necessary, replace entire unit.

21. Remove the injection pump and O-ring.



LVAL13792—UN—18NOV10

OUO1023,0002EE2 -19-15FEB11-4/5

Installing:

1. Install new O-ring to the injection pump.
2. Put injection pump onto back of gear cover mounting plate. Install three mounting nuts. Do not tighten. Align key on shaft with keyway in gear. Be sure to align marks on gears made during removal.

3. Install nut on timing gear. Tighten to specification.

Specification

Timing Gear	
Nut—Torque.....	58—68 N·m (43—50 lb.-ft.)

4. Align marks (I) on mounting plate and injection pump, to same place as when removed. Tighten mounting nuts (J) to specifications.

Specification

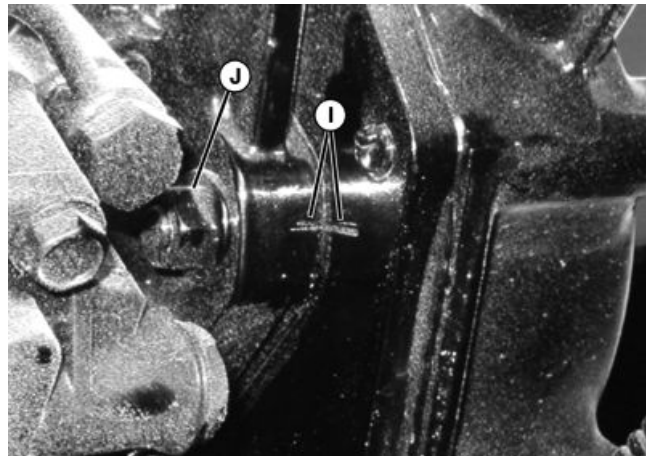
Injector Line	
Nuts—Torque.....	30—35 N·m (22—25 lb.-ft.)

5. Place a thin bead of John Deere form in place gasket on the cover. Install the cover.
6. Install and connect fuel shutoff solenoid.
7. Connect hoses to/from fuel filter.
8. Install fuel injection lines and tighten line clamps to specification.

Specification

Injector Line	
Nuts—Torque.....	30—35 N·m (22—25 lb.-ft.)

9. Mount the fuel pump on the injection pump.
10. Connect and adjust the throttle linkage. (See Throttle Rod Adjustment in Section 30, Group 25.)



I— Marks

J— Nuts

LVAL13793—UN—18NOV10

IMPORTANT: Avoid Damage! If the oil has been drained out of the fuel injection pump housing, add oil as necessary. The fuel injection pump can be damaged if operated without the proper amount of oil.

11. Remove the fill plug and add clean engine oil to the housing. Add until the oil begins to drip out of external lube line inlet.
12. Install the external lube line. When installing the line, put one copper washer between the mounting bolt head and lube line and the other between the lube line and housing.
13. If a new injection pump is being installed, check and adjust injection pump static timing. (See Injection Pump Timing—EPA Engines in Section 30, Group 25.)

OUO1023,0002EE2 -19-15FEB11-5/5

Fuel Injection Nozzles

Removing:

1. Park machine safely. (See Park Machine Safely in Section 10, Group 05.)
2. Raise hood.
3. Allow engine to cool.

IMPORTANT: Avoid Damage! Never steam clean or pour cold water on injection pump while the pump is running or warm. Doing so can damage the pump.

4. Clean the injection pump lines and area around the pump using parts cleaning solvent or steam cleaner.

⚠ CAUTION: Avoid Injury! Escaping fluid under pressure can penetrate the skin causing serious injury. Avoid the hazard by relieving pressure before disconnecting hydraulic or other lines. Tighten all connections before applying pressure. Search for leaks with a piece of cardboard. Protect hands and body from high pressure fluids.

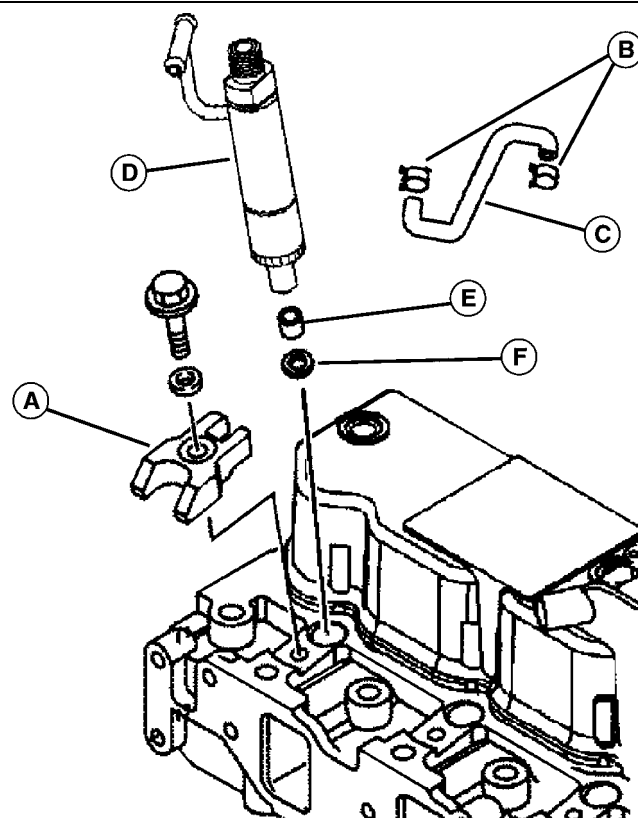
If an accident occurs, see a doctor immediately. Any fluid injected into the skin must be surgically removed within a few hours or gangrene may result. Doctors unfamiliar with this type of injury should reference a knowledgeable source. Such information is available from the Deere & Company Medical Department in Moline, Illinois, U.S.A.

5. Loosen fuel injection line connectors-to-nozzles slightly to relieve pressure in the fuel system.

NOTE: Nozzles are matched to the cylinders. If removing more than one nozzle, tag nozzles, according to the cylinder from which it was removed.

6. Loosen line clamp(s) and remove fuel injection lines.
7. Remove clamps (B) and leak-off hoses (C).

TEFLON is a trademark of DuPont Co.



A—Retaining Plates
B—Clamps
C—Leak-off Hoses

D—Injection Nozzle
E—Ring
F—Heat Protector

8. Remove nuts and retaining plates (A).
9. Remove injection nozzle (D), ring (E) and TEFLON® heat protector (F). If ring and protector stay in cylinder head, thread a cap screw into protector and pull from cylinder head.

LVAL13794—UN—18NOV10

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OUC1023,0002EE3 -19-10FEB11-1/5

10. If nozzles are stuck in cylinder head:

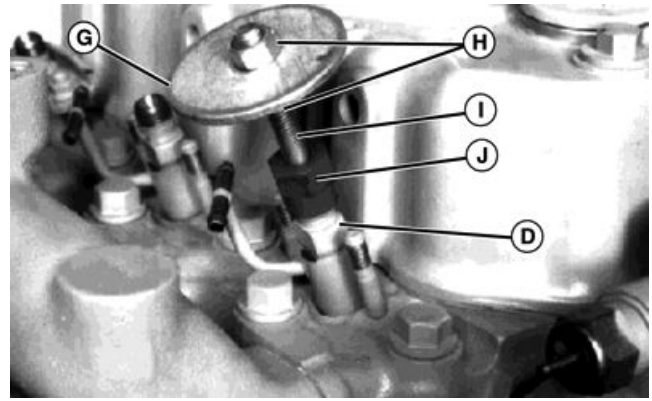
- a. Grind the head of a cap screw (I) so it fits inside a nut from an old injection line (J).
- b. Use two nuts (H) to attach a large flat washer (G) to the cap screw.
- c. Install assembly onto nozzle (D) and use a puller and slide hammer to pull nozzle from cylinder head.

11. Test injection nozzles. (See Fuel Injection Nozzle Test in Section 30, Group 25.)

Installing:

Installation is the reverse of removal.

- Install a new ring and heat protector when installing injection nozzles.



D—Nozzle
G—Large Flat Washer
H—Nut (2 used)

I—Cap Screw
J—Old Injection Line

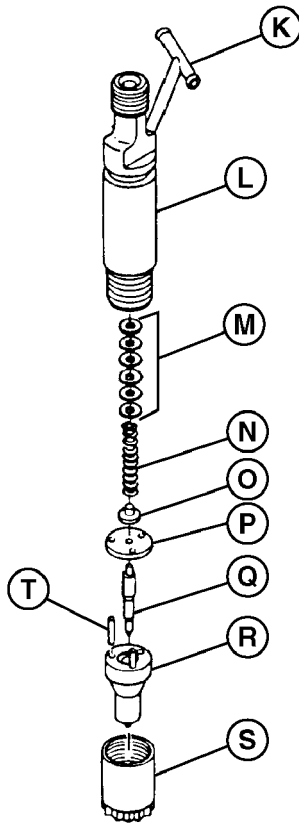
LVAL13795—UN—18NOV10

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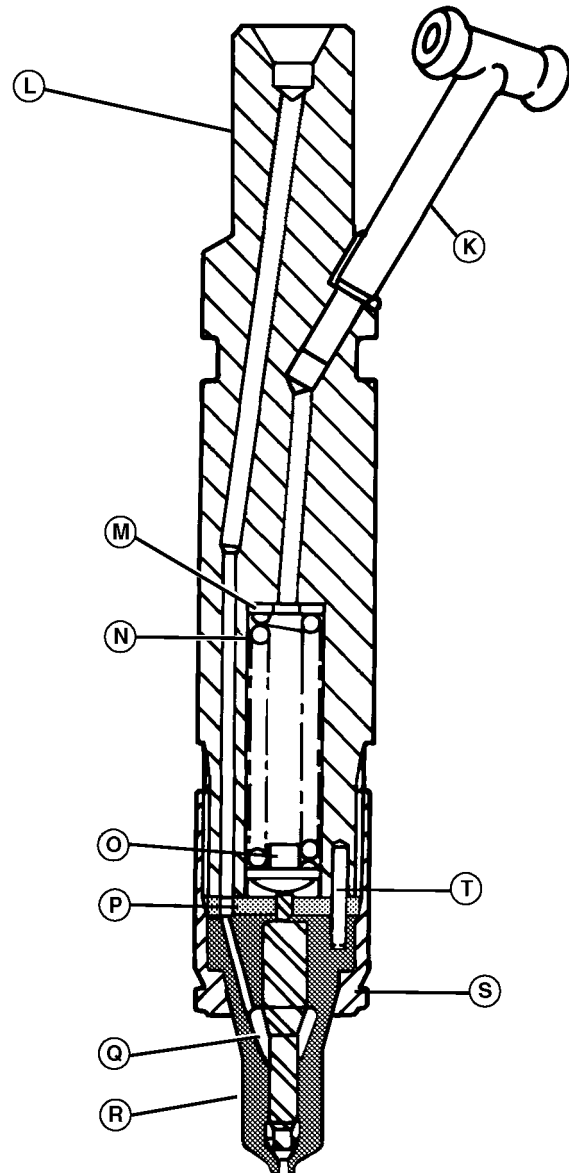
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Disassembly/Assembly:

NOTE: If servicing more than one nozzle, keep parts for each nozzle separate from one another.



1. Remove retaining nut (S) and disassemble internal parts of injection nozzle. Keep parts organized for ease of assembly.



LVAL13892 —UN—20DEC10

LVAL13796 —UN—30NOV10

K—Return Pipe
L—Injector Body
M—Shim(s)

N—Spring
O—Spring Seat
P—Separator Plate

Q—Nozzle Valve
R—Nozzle Body
S—Retaining Nut

T—Index Pin

2. Clean and inspect nozzle assembly. See "Cleaning/Inspection" below.
3. Carefully clamp injector body (L) in a soft-jaw vice.

NOTE: Insert the same number of shims (M) that were removed from injector. Number of shims will affect the opening pressure of the fuel nozzle and will be tested after assembly.

4. Reassemble fuel nozzle in the order shown above.

5. Tighten retaining nut to specification.

Specification

Injector Retaining	
Nut—Torque.....	6.8—8.8 N·m (60—78 lb.-in.)

6. After assembly is complete, test injection nozzle. (See Fuel Injection Nozzle Test in Section 30, Group 25.)

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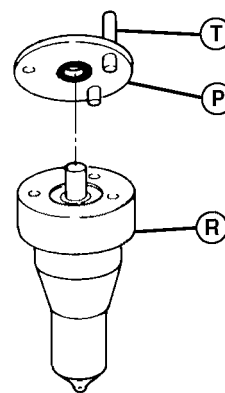
Cleaning/Inspection:

NOTE: To clean nozzles properly, JDF13 Nozzle Cleaning Kit is recommended. The Cleaning Kit is available through the John Deere SERVICEGARD™ Catalog.

1. Remove anti-corrosive grease from new or reconditioned nozzles by washing them thoroughly in diesel fuel.

IMPORTANT: Avoid Damage! Never use a steel brush to clean nozzles as this will distort the spray hole.

2. Remove carbon from used nozzles, and clean by washing in diesel fuel. If parts are coated with hardened carbon or lacquer, it may be necessary to use a brass wire brush (supplied in Nozzle Cleaning Kit).
3. After removing carbon or lacquer from the exterior of nozzle, inspect sealing surfaces between separator plate (P) and nozzle body (R) for nicks or scratches.
4. Contact area of separator plate (both parts) must not be scored or pitted. Use an inspection magnifier (No. 16487 or equivalent) to aid in making the inspection.



P—Separator Plate
R—Nozzle Body

T—Index Pin

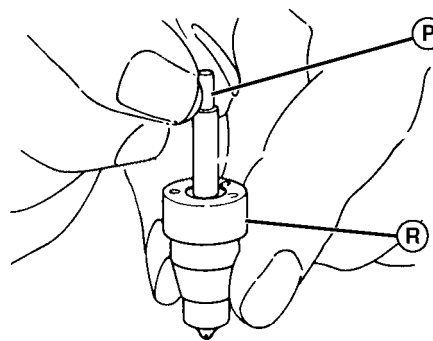
5. Check nozzle contact surface on separator plate for wear. If contact surface is more than **0.10 mm (0.004 in.)**, replace nozzle assembly.

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LVAL13798—UN—30NOV10

6. Inspect the piston (large) part of nozzle valve (P) to see that it is not scratched or scored and that lower (tip) end of valve is not broken. If any of these conditions are present, replace the nozzle assembly.
7. Further inspect the nozzle assembly by performing a slide test. Use the following procedure:
 - a. Dip the nozzle valve (P) in clean diesel fuel. Insert valve in nozzle body (R).
 - b. Hold nozzle vertical, and pull valve out about 1/3 of its engaged length.
 - c. Release valve. Valve should slide down to its seat by its own weight.

Replace nozzle assembly if the valve does not slide freely to its seat.



P—Nozzle Valve

R—Nozzle Body

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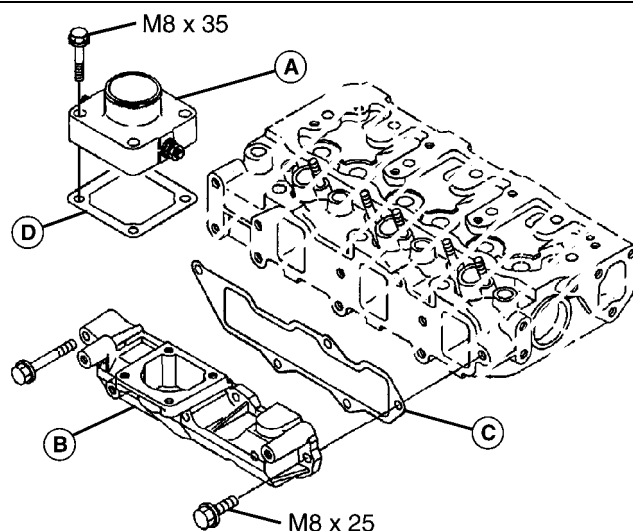
LVAL13799—UN—30NOV10

Intake Manifold

1. Remove the fuel filter bracket (not shown).
2. Remove the intake air heater (A).
3. Remove the fuel injection lines (not shown).
4. Remove the intake manifold (B).
5. Clean the mating surfaces, and replace the intake manifold gasket (C).
6. Install the intake manifold.
7. Replace the intake air heater gasket (D). Install the intake air heater.
8. Install the fuel injection lines.
9. Tighten fasteners to specification.

A—Heater
B—Intake Manifold

C—Manifold Gasket
D—Heater Gasket



LVAL13800 —UN—18NOV10

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Muffler Removal and Installation

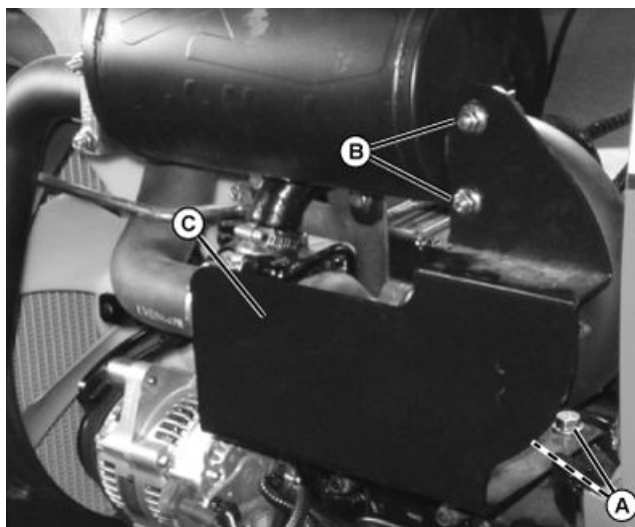
Removal:

⚠ CAUTION: Avoid Injury! Touching hot surfaces can burn skin. Allow the engine to cool before servicing or working near the engine and components.

1. Park machine safely. See Parking Safely in the Safety Section.
2. Allow engine to cool.
3. Raise hood.
4. Remove two mounting cap screws (A) and the pipe clamp nuts (B). Remove the heat shield (C).

A—Mounting Cap Screws
B—Pipe Clamp Nuts

C—Heat Shield



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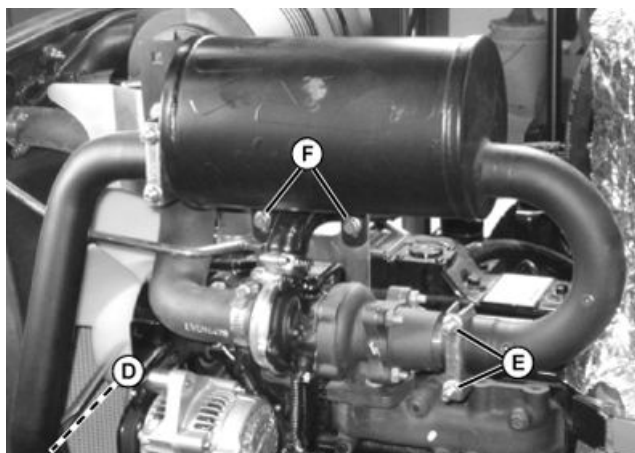
OUO1023,0002EE5 -19-10FEB11-1/2

5. Remove the exhaust pipe mounting cap screw (D), and the pipe clamp nuts (E).
6. Remove two muffler mounting cap screws (F). Remove the muffler.

Installation:

1. Install the muffler assembly. Tighten all connections securely.
2. Install the exhaust system heat shield.

D—exhaust pipe mounting cap screw F—Muffler Mounting Cap Screws
E—Pipe Clamp Nuts



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Turbocharger Removal and Installation

Turbochargers used on the engines covered in this manual are available through service parts as a complete remanufactured assembly only. Individual components for repair are not available.

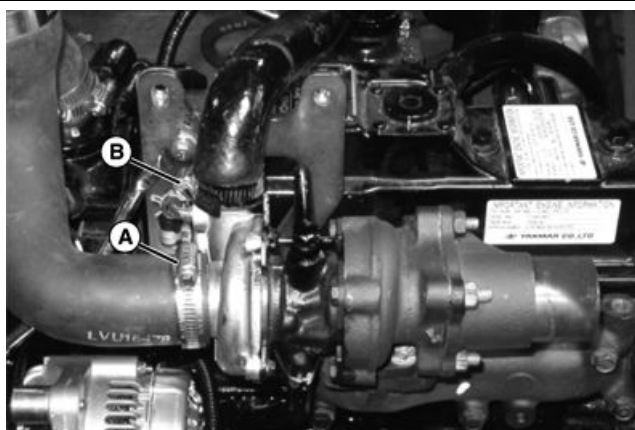
Removal:

CAUTION: Avoid Injury! Touching hot surfaces can burn skin. Allow the engine to cool before servicing or working near the engine and components.

IMPORTANT: Avoid Damage! When cleaning turbocharger, do not spray directly into compressor cover or turbine housing. If turbocharger inspection is required, do not clean exterior prior to removal. Doing so may wash away evidence of a potential failure.

Thoroughly clean exterior of turbocharger and surrounding area to prevent entry of dirt into the intake system during removal.

1. Park machine safely. (See Park Machine Safely in Section 10, Group 05.)
2. Allow engine to cool.
3. Raise hood.
4. Remove the muffler. (See Muffler Removal and Installation in Section 30, Group 30.)
5. Loosen the hose clamps (A and B) and remove the inlet and outlet air hoses.



A—Hose Clamp

B—Hose Clamp

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6. Disconnect banjo bolt (C), seal washers, and oil inlet line from center housing.
7. Remove two cap screws (D). Disconnect the oil return tube from the center housing.
8. Remove four nuts (E). Remove the exhaust adaptor from the turbine housing.
9. Remove three turbocharger mounting nuts securing turbocharger to exhaust manifold. Remove turbocharger.
10. Cap or plug all openings on engine (exhaust and intake manifold related). Place turbocharger on a clean flat table for inspection.
11. Perform turbocharger inspection. (See Turbocharger Inspection in Section 30, Group 25.)

Installation:

IMPORTANT: Avoid Damage! If turbocharger failed because of foreign material entering the air intake system, be sure to examine the system. Clean as required to prevent a repeat failure.

DO NOT spin the rotor assembly with compressed air. Damage to bearings can occur.

1. Fill oil return (drain) port with clean engine oil. Spin rotating assembly by hand to lubricate bearings.
If turbocharger is to be stored for an extended period of time, lubricate internally and install protective covers on all openings.
2. Put a new gasket on turbocharger-to-exhaust manifold mounting surface.
3. Position turbocharger against gasket on exhaust manifold.
4. Apply PT569 NEVER-SEEZ® Compound to turbocharger mounting studs.
5. Install nuts. Tighten to specifications.

Specification

Turbocharger-to-Exhaust Manifold Nuts—Torque.....	32 N·m (22 lb.-ft.)
---	------------------------

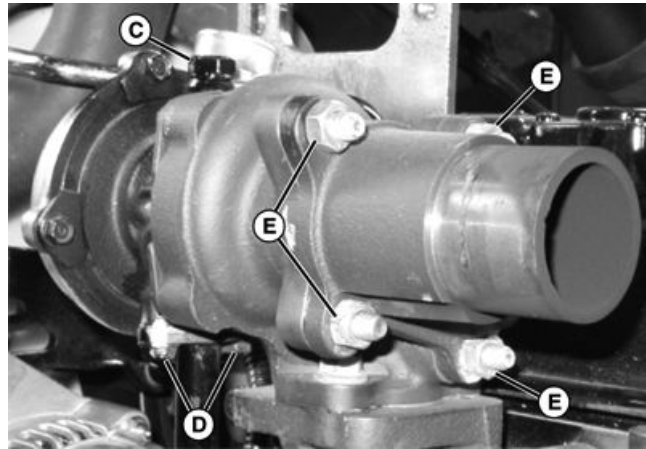
NOTE: Remove caps or plugs from turbocharger.

6. Install turbocharger oil return (drain) tube using a new O-ring. Tighten cap screws to specifications.

Specification

Turbocharger Oil Return Line Cap Screws—Torque.....	11 N·m (97 lb.-in.)
---	------------------------

7. Position the seal washers (one on each side) on the oil inlet line. Install the banjo bolt. Tighten to specification.



C—Banjo Bolt
D—Cap Screw (2 used)

E—Nut (4 used)

Specification

Turbocharger Oil Inlet Line Banjo Bolt—Torque.....	10 N·m (88.5 lb.-in.)
--	--------------------------

8. Connect air intake hoses to turbocharger. Tighten connections securely.
9. Install the exhaust adaptor to the turbine housing and tighten the nuts to specification.

Specification

Exhaust Adaptor-to-Turbocharger Nuts—Torque.....	32 N·m (22 lb.-ft.)
--	------------------------

10. Install the muffler assembly. Tighten connections securely.
11. Disconnect the fuel shutoff solenoid electrical connector. If removed, connect all other electrical connections.

IMPORTANT: Avoid Damage! BEFORE STARTING an engine with a new or repaired turbocharger, crank the engine over (but do not start) for several seconds to allow engine oil to reach turbocharger bearings. The electrical system will not allow engine to crank longer than 15 seconds at a time to avoid damaging starting motor.

12. Turn the key switch to START. Hold for 3—5 seconds to allow engine oil to reach turbocharger bearings.
13. Connect the fuel shutoff solenoid electrical connector.
14. Start and run engine at low idle while checking oil inlet and air piping connections for leaks.
15. Install the exhaust system heat shield.

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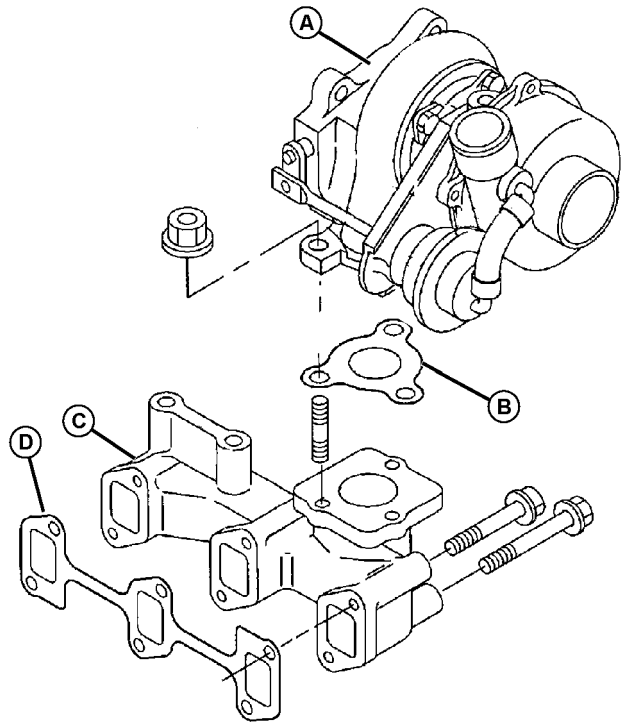
OUC1023,0002EE6 -19-10FEB11-2/3

Exhaust Manifold

1. Remove the turbocharger (A) (if equipped), and gasket (B).
2. Remove the exhaust manifold (C) and gasket (D).
3. Clean the mating surfaces. Replace the exhaust manifold and turbo gaskets.
4. Install the exhaust manifold. Tighten all fasteners.
5. Install the turbocharger (if equipped), and tighten fasteners.

A—Turbocharger
B—Gasket

C—Exhaust Manifold
D—Gasket



LVAL13930 —UN—14JAN11

Starting Motor Removal and Installation

Removing:

IMPORTANT: Avoid Damage! Always disconnect the negative cable from the battery before working on any electrical components.

1. Park machine safely. See Parking Safely in the Safety Section. (See Park Machine Safely in Section 10, Group 05.)
2. Allow engine to cool.
3. Raise hood.
4. Disconnect the negative cable from the battery.

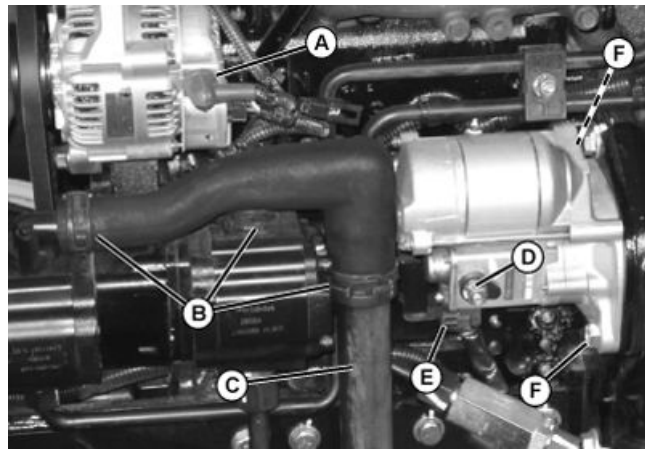
NOTE: Cap the hydraulic ports to prevent dirt from entering the hydraulic system.

5. Remove the alternator (A).

NOTE: It is not necessary to remove the suction tube.

6. Remove three clamps (B) securing the suction manifold to the hydraulic pump. Remove manifold.
7. Remove two suction tube (C) supports. Allow the suction tube to pivot away from the machine frame and rest on the front tire.
8. Remove the nut securing the battery cable and wires on the starting motor (D).
9. Disconnect the starting motor solenoid wire (E).

Item	Measurement	Specification
Starting Motor Cap Screws	Torque	88 N·m (65 lb.-ft.)



A—Alternator
B—Clamps (3 used)
C—Suction Tube

D—Starting Motor
E—Solenoid Wire
F—Cap Screw (2 used)

10. Remove two cap screws (F) securing the starting motor to the bell housing. Remove the starting motor.

Installing:

Installation the reverse of removal.

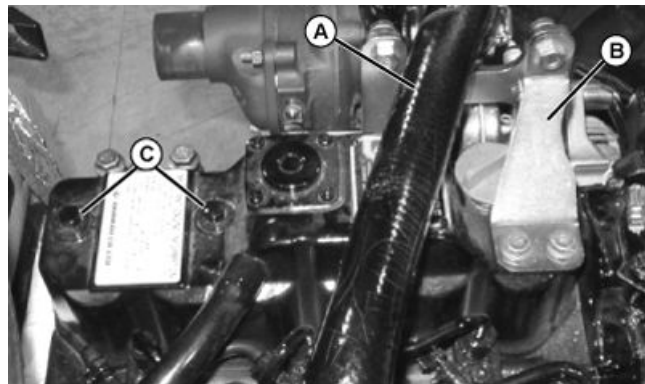
- DO NOT overtighten the starting motor cap screws! Tighten the starting motor cap screws to specification.

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Rocker Cover Removal and Installation

1. Park machine safely. See Parking Safely in the Safety Section.
2. Allow engine to cool.
3. Raise hood.
4. Disconnect the negative cable from the battery.
5. Remove the muffler. (See Muffler Removal and Installation in Section 30, Group 30.)
6. Remove the air intake hose (A) and the muffler support bracket (B).



A—Air Intake Hose
B—Muffler Support Bracket

C—Special Nuts

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OUO1023,0002EE9 -19-10FEB11-1/2

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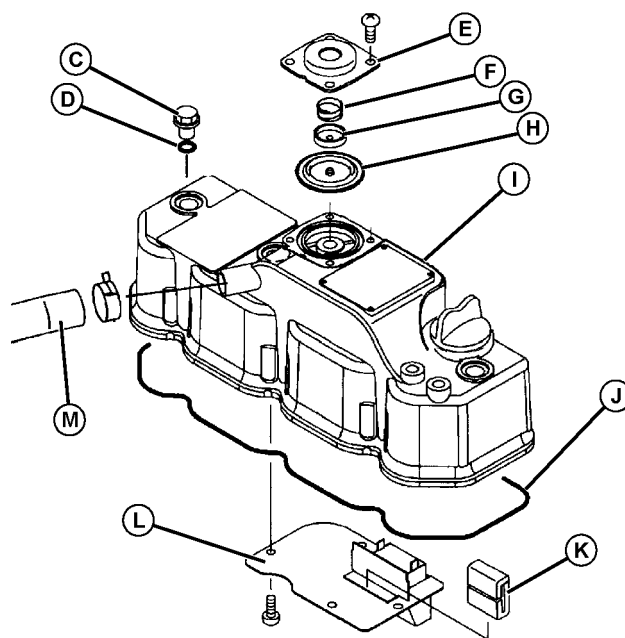
7. Remove three special nuts (C) and O-rings (D).
8. Disconnect hose (M).
9. Remove rocker cover (I).
10. Remove diaphragm cover (E), spring (F), center plate (G), and diaphragm (H).

NOTE: *There should not be any oil between the top of the diaphragm and the diaphragm cover. If there is diaphragm must be replaced*

11. Remove baffle plate (L), and breather baffle (K).
12. Clean and inspect all parts, particularly the diaphragm and spring. Replace any worn or damaged parts.
13. Reassemble rocker cover. Clean gasket surface on cylinder head. Install rocker cover.

C—Special Nuts
D—O-Rings
E—Diaphragm Cover
F—Spring
G—Center Plate
H—Diaphragm

I—Rocker Cover
J—Gasket
K—Breather Baffle
L—Baffle Plate
M—Hose



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OUO1023,0002EE9 -19-10FEB11-2/2

Engine Removal and Installation

Special or Required Tools:

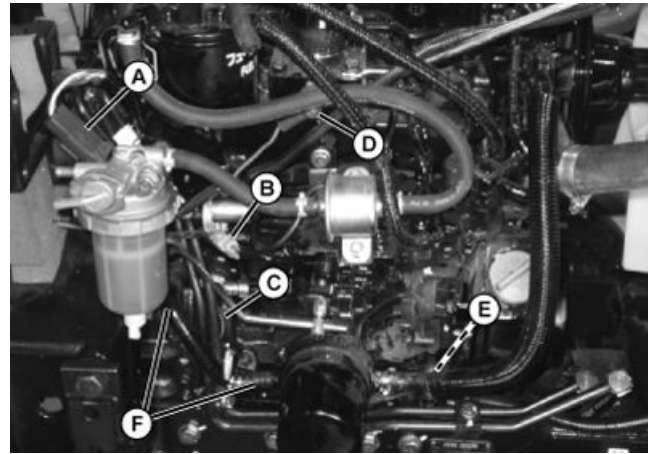
- JTO7335 Splitting Stands
- JDG23 Engine Lifting Sling

Prepare the Machine:

1. Park machine safely. See Parking Safely in the Safety Section.
2. Allow engine to cool.
3. Open and remove hood. (See Hood Removal and Installation in Section 120, Group 10.)
4. Disconnect negative and then positive battery cables. Remove battery.
5. Drain the coolant from the radiator and the engine block. Remove the radiator. (See Water Pump Removal and Installation in Section 30, Group 10.) and (See Radiator Removal and Installation in Section 30, Group 10.)
6. Drain the engine crankcase oil.
7. Remove the muffler. (See Muffler Removal and Installation in Section 30, Group 10.)
8. Remove steering wheel. (See Steering Wheel Removal and Installation in Section 100, Group 30.)
9. Remove fuse panel cover.
10. Remove cowl panels. (See Cowl Panel Removal and Installation in Section 120, Group 10.)
11. Remove control panel. (See Control Panel Removal and Installation in Section 120, Group 10.)
12. Remove fuel tank. (See Fuel Tank Removal and Installation in Section 120, Group 20.)

Removal:

1. Disconnect the fuel solenoid connector (A).



A—Fuel Solenoid Connector
B—Fuel Pump Connector
C—Engine Oil Pressure Switch
D—Intake Manifold Air Heater
E—Frame Ground Wires And Cable
F—Coolant Hose

2. Disconnect the fuel pump connector (B).
3. Disconnect the engine oil pressure switch (C).
4. Disconnect the intake manifold air heater (D).
5. Disconnect the frame ground wires and cable (E) from the engine.
6. Remove the wire harness tie straps. Route the wire harness toward the rear of the machine, clear of the engine.
7. Remove the coolant hose (F) from the engine block to the rear side of the oil filter housing.

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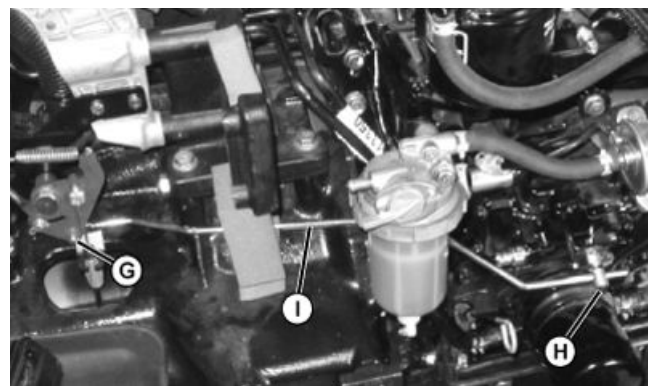
OUO1023,0002EEA -19-10FEB11-1/9

NOTE: Note or mark hydraulic hoses for assembly.

8. Remove cotter pin (G). Loosen the set screw (H). Remove the throttle linkage (I) from throttle lever on fuel injection pump.

G—Cotter Pin
H—Set Screw

I—Throttle Linkage



LVAL13934—UN—14JAN11

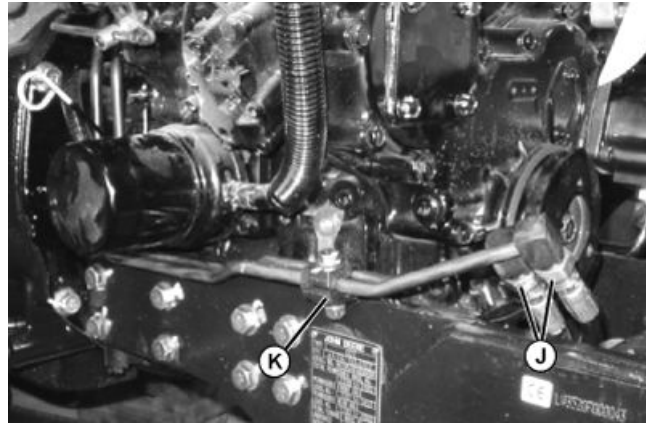
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OUO1023,0002EEA -19-10FEB11-2/9

9. Disconnect steering lines from steering hoses (J).
10. Remove line clamp (K) securing steering lines to engine.

J—Steering Hoses

K—Line Clamp



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11. Disconnect the battery cable and input wire (L) from the starting motor.
12. Disconnect the battery cable and sensing wires (M) from the alternator.
13. Disconnect the wire to the coolant temperature sensor (N).
14. Remove the wire harness tie straps. Route the wire harness toward the rear of the machine, clear of the engine.
15. Disconnect pressure lines from hydraulic pump (O).
16. Loosen hose clamps (P) and disconnect suction line from suction manifold.
17. Remove cap screw and tube clamp (Q) securing suction line to the frame.
18. PowrReverser - Disconnect suction line from suction filter assembly (R).
19. eHydro - Disconnect hydraulic line from filter housing and drain oil cooler (R).
20. eHydro - Disconnect hydraulic oil cooler lines (S) from steering control unit

NOTE: Note or mark hydraulic fittings for assembly.

21. Disconnect the hydraulic lines.

L—Input Wire

M—Battery Cable And Sensing Wires

N—Coolant Temperature Sensor

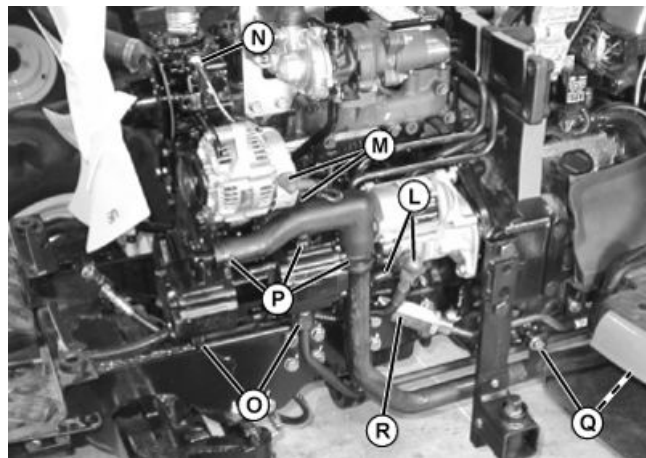
O—Hydraulic Pump

P—Hose Clamps

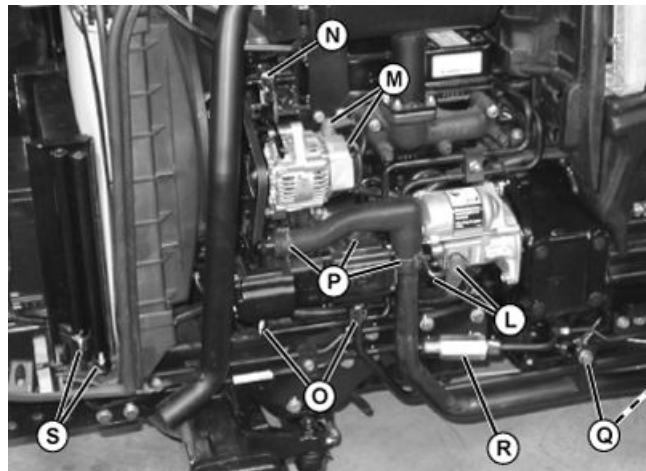
Q—Tube Clamp

R—Suction Filter Assembly

S—Oil Cooler Lines



PowrReverser Models



eHydro Models

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LVAL13937—UN—14JAN11

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22. Remove the hydraulic lines (T) at the steering control unit. Remove the hydraulic lines.

T—Hydraulic Lines

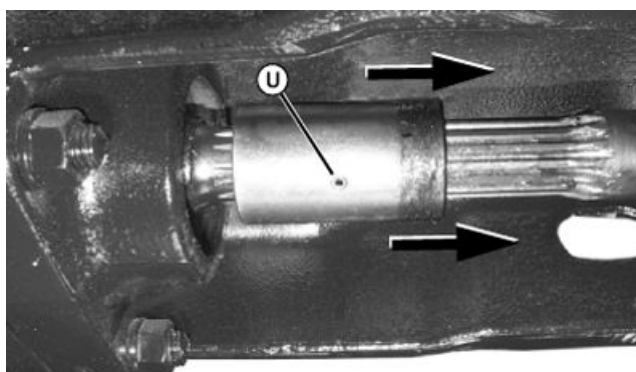


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23. Remove split pins (U) from couplers. Remove the MFWD drive shaft from the machine.

U—Split Pins



Coupler

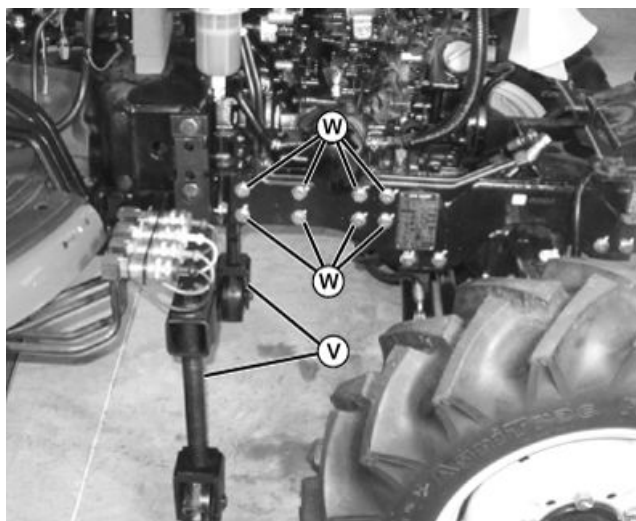
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24. Using cap screws supplied with the splitting stands, secure JT07335 splitting stands (V) to the tunnel section.
25. Raise the front of the machine with the splitting stands, enough to keep minimal tire pressure on the floor and support frame to allow front axle and frame removal.
26. Remove the eight frame mounting cap screws (W) on each side of machine.

V—Splitting Stands

W—Mounting Cap Screws (8 used)



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IMPORTANT: Avoid Damage! Engine lifting straps can be procured through service parts. Use of an engine lifting sling and lifting straps is the ONLY APPROVED method for lifting engine.

27. Carefully roll the front axle and frame assembly forward to clear the engine. When clear, roll the front axle assembly to an area away from the work area.

Using a hoist, support the engine using the lift sling (X) attached to the lift straps.

28. Remove two nuts (Y), and six cap screws (Z) attaching engine to tunnel section. Note length and locations of cap screws when removing.
29. If necessary, use a pry bar to separate the two machine sections. Split the engine from the tunnel by pulling the engine away from the tunnel section.

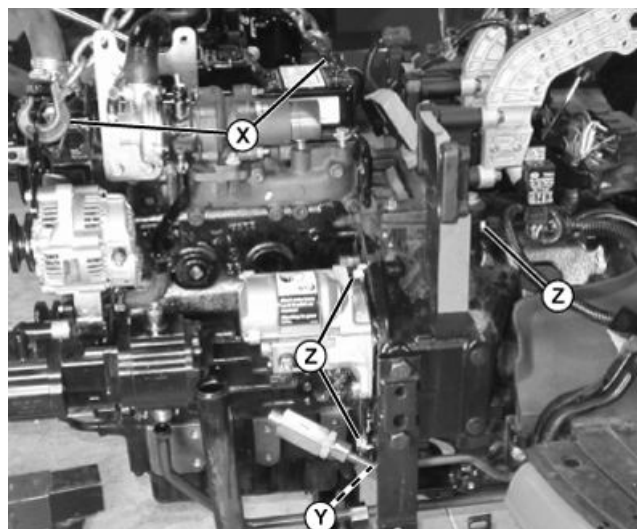
Installation and Assembly:

NOTE: Splines on all drive shafts and couplers must be aligned before machine sections are bolted together.

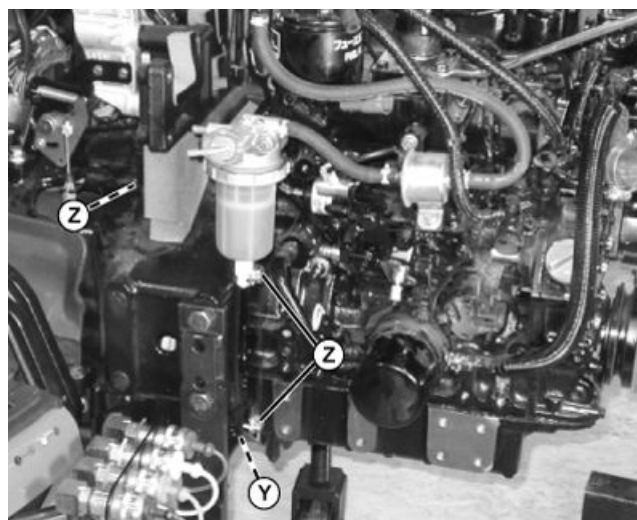
1. Align splines on drive shaft and engine flywheel.
2. Move engine and tunnel section together. Retain with cap screws and nuts. Tighten cap screws to **130 N·m (95 lb-ft)**.
3. Roll the front axle and frame assembly in place in front of machine.
4. Install eight frame mounting cap screws on each side of machine. Tighten the M14 cap screws on each side of the engine to **130 N·m (95 lb-ft)**.

NOTE: Install line from hydraulic pump to steering control unit before installing steering hydraulic lines.

5. Install MFWD shaft and couplers.
6. Install and connect hydraulic lines and steering hydraulic lines to steering control unit.
7. Connect steering lines from steering hoses.
8. Connect suction line to suction filter assembly.
9. Install line clamps securing steering lines to engine. Tighten nuts to **40 - 57 N·m (30 - 43 lb-ft)**.
10. Connect suction manifold to suction tube and hydraulic pump and retain with hose clamp.
11. Connect pressure lines to hydraulic pump. Tighten fitting to **40 - 57 N·m (30 - 43 lb-ft)**.
12. Install tube clamp securing hydraulic lines and secure with cap screw and lock nut.
13. If equipped: Install and connect hydraulic oil cooler lines, from filter and steering control unit.
14. Route main wiring harness and connect electrical components:



Left side.



Right side.

X—Lift Sling
Y—Nuts (2 used)

Z—Cap Screws (6 used)

- a. engine temperature sensor
 - b. starting motor solenoid
 - c. alternator connectors
 - d. fuel pump
 - e. fuel shutoff solenoid
 - f. manifold heater
 - g. engine oil pressure switch
 - h. throttle sensor - eHydro Models
15. Replace plastic tie bands removed during disassembly.
 16. Connect battery positive cable and wiring harness connector to starting motor.

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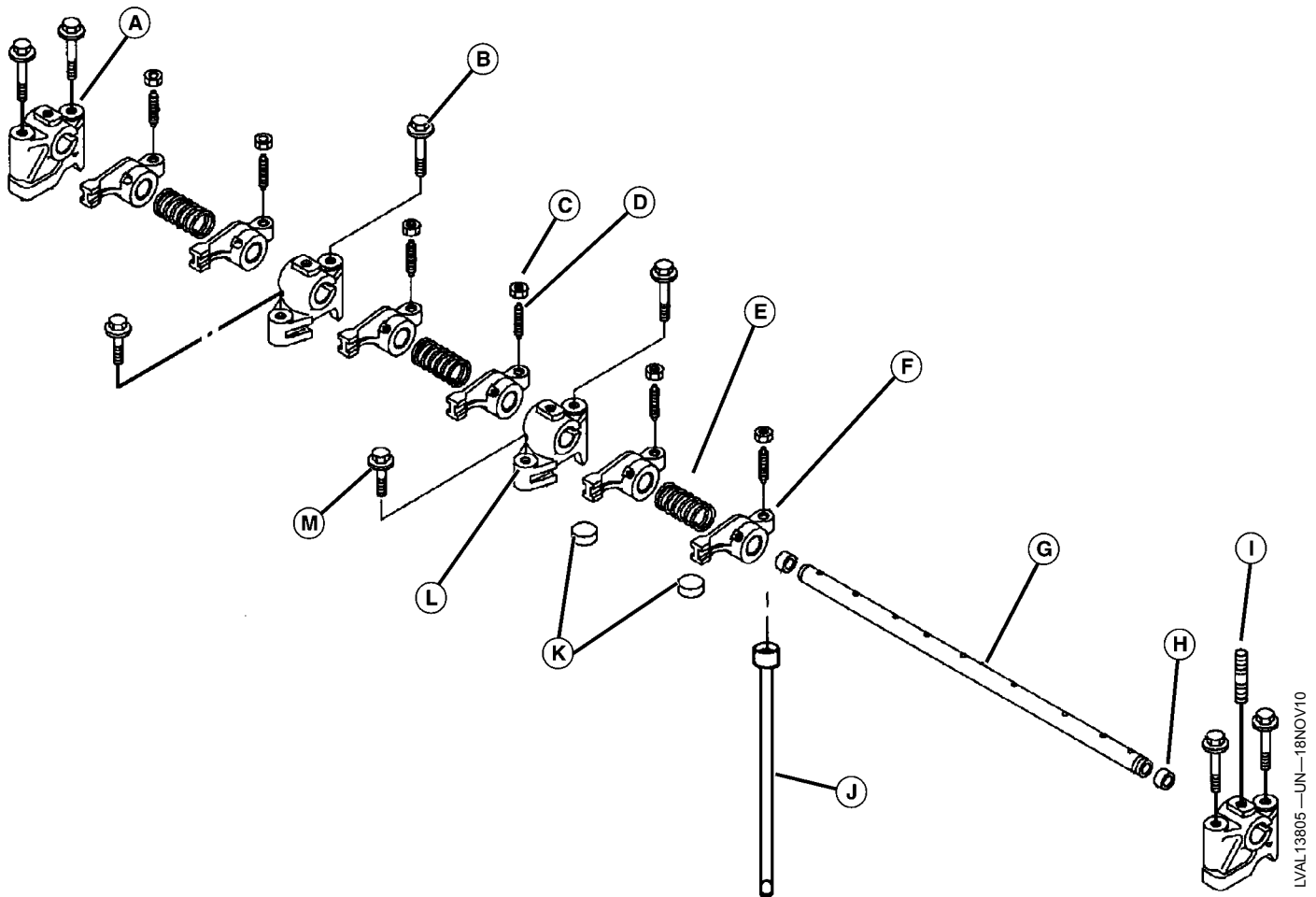
OUC1023,0002EEA -19-10FEB11-8/9

17. Connect battery negative cable and wiring harness ground wires to engine.
18. Install, connect, and adjust the throttle linkage. (See Throttle Rod Adjustment in Section 30, Group 10.)
19. Install fuel tank. (See Fuel Tank Removal and Installation in Section 120, Group 20.)
20. Install control panel. (See Control Panel Removal and Installation in Section 120, Group 10.)
21. Install cowl panels. (See Cowl Panel Removal and Installation in Section 120, Group 10.)
22. Install fuse panel cover.
23. Install steering wheel. ((See Steering Wheel Removal and Installation in Section 100, Group 30.)
24. Install the muffler. (See Muffler Removal and Installation in Section 30, Group 10.)
25. Fill the engine crankcase oil.
26. Check that the petcock is closed. Install the radiator. ((See Water Pump Removal and Installation in Section 30, Group 10.) and (See Radiator Removal and Installation in Section 30, Group 10.). Fill and bleed the cooling system. Approximate radiator capacity is 5.3 liters (5.6 qt).
27. Install battery. Connect positive and then negative battery cables.
28. Install hood. (See Hood Removal and Installation in Section 120, Group 10.)
29. Fill transmission with oil.
30. Check and add hydraulic fluid to the reservoir.
31. Bleed air from hydraulic system. (See Hydraulic System Bleed Procedure in Section 90, Group 30.)

OUO1023,0002EEA -19-10FEB11-9/9

Rocker Arm Assembly

Removal/Installation and Disassembly/Assembly:



A—Shaft End Support (2 used)
B—Cap Screw, M8 x 50 (6 used)
C—Jam Nut (6 used)

D—Adjuster Screw (6 used)
E—Spring (3 used)
F—Rocker Arm
G—Rocker Arm Shaft

H—Plug (2 used)
I—Stud
J—Push Rod (6 used)
K—Valve Caps (6 used)

L—Center Support (2 used)
M—Cap Screw, M8 x 25

1. Remove the rocker cover. (See Rocker Arm Assembly in Section 30, Group 30.)

2. Remove the rocker arm end support and rocker arm center support mounting cap screws.

3. Lift the rocker arm assembly from the cylinder head and set the assembly on a bench.

NOTE: If the rocker arm shaft assembly is to be disassembled, replace components in same location on the rocker arm shaft they were removed from.

4. Note the positions of the rocker arm assembly components. Slide the components off the rocker arm shaft.

5. Lift the push rods from the cylinder head. Note the order of removal for reassembly.

6. Inspect the rocker arm components and push rods.

7. Reinstall the push rods to their original location in the cylinder head, with the ball shaped end down in head.

8. Lubricate parts with new oil during assembly.

9. Assemble the rocker arm assembly components in the reverse order of removal.

10. Place the rocker arm assembly on the cylinder head.

- Align the rocker arms with the valves and push rods.
- Align the rocker arm end and center supports with corresponding holes in the cylinder head.

11. Install the rocker arm support cap screws. Tighten the cap screws to specification.

Specification

Rocker Arm Support Cap

Screw—Torque.....26 N·m
(19 lb.-ft.)

Continued on next page

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12. Adjust the valve clearance.

OUO1023,0002EEB -19-10FEB11-2/6

Inspection:

1. Measure the outer diameter of the rocker arm shaft.
 - Rocker arm shaft outer diameter is **15.966—15.984 mm (0.6285—0.6295 in.)**.
 - Replace the rocker arm shaft if the outer diameter is less than **15.94 mm (0.6275 in.)**.



LVAL13806 —UN—30NOV10

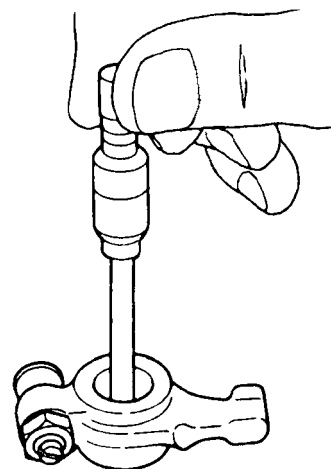
OUO1023,0002EEB -19-10FEB11-3/6

2. Measure the inner diameters of the rocker arms and supports.

- Standard inner diameter is **16.00—16.02 mm (0.630—0.631 in.)**.
- Replace the rocker arms or supports if the inner diameter is more than **16.07 mm (0.633 in.)**.

3. Measure the rocker arm shaft to rocker arm bushing oil clearance. Oil clearance is the difference between the outer diameter of the rocker arm shaft and the inner diameter of the rocker arms.

- Standard oil clearance is **0.02—0.05 mm (0.001—0.002 in.)**.
- If the clearance exceeds **0.13 mm (0.005 in.)** replace the rocker arm shaft and rocker arms.

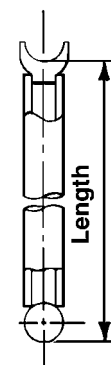
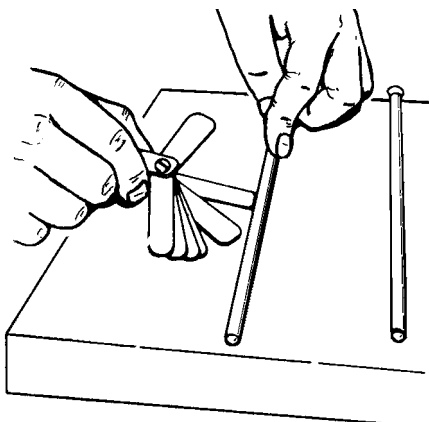


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OUO1023,0002EEB -19-10FEB11-4/6

Measure Bending of Push Rod:

1. Place the push rod on a flat surface.
2. Use a feeler gauge to measure gaps between the push rod and flat surface. Replace a push rod with over **(0.03 mm (0.001 in.)** bend.



LVAL13808 —UN—18NOV10

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OUO1023,0002EEB -19-10FEB11-5/6

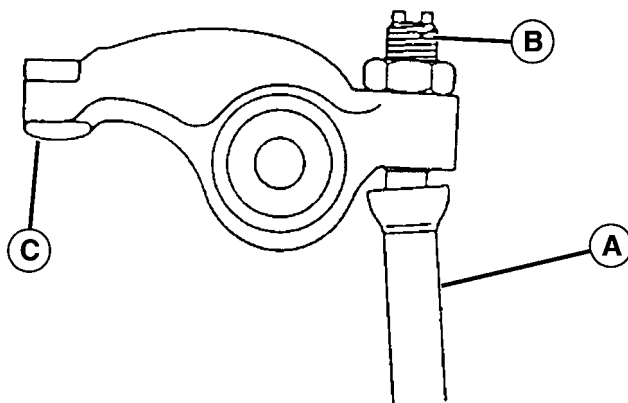
Inspect Rocker Arm Contact Surfaces:

1. Check the surface of the adjusting screw that contacts the push rod (A) for wear. Replace the adjusting screw (B) if it is worn or damaged.
2. Check the surface (C) of the rocker arm that comes in contact with the valve cap for wear. Replace rocker arm if necessary.
3. Check the socket portion of the push rod where the valve clearance adjusting screw contacts the push rod. Replace the push rod if it is worn or damaged.

A—Push Rod

B—Adjusting Screw

C—Surface



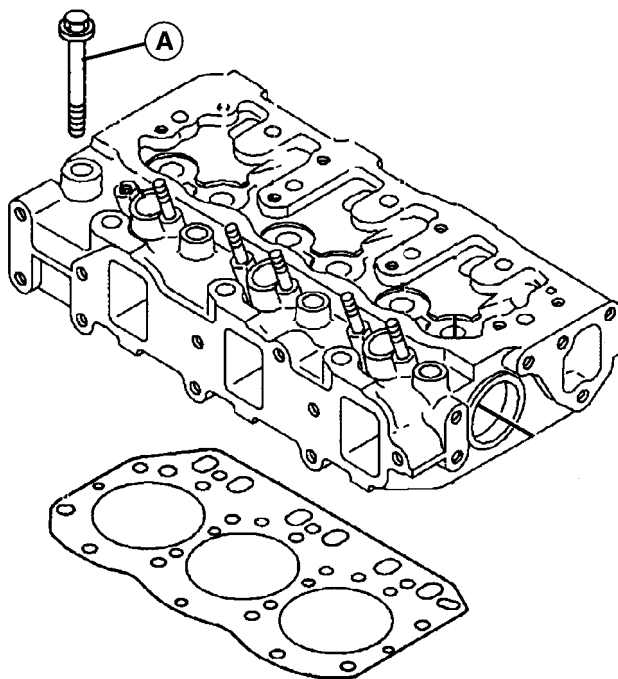
LVAL13809—UN—18NOV10

OUO1023,0002EEB -19-10FEB11-6/6

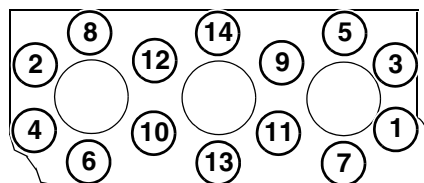
Cylinder Head and Valves Removal and Installation**Removing:**

1. Remove the rocker arm cover.
2. Remove the rocker arm assembly, push rods and valve caps. (See Rocker Arm Assembly in Section 30, Group 30.)
3. Remove the exhaust and intake manifolds. (See Exhaust Manifold in Section 30, Group 30.)
4. Remove the water pump.
5. Remove the fuel injection nozzles. (See Fuel Injection Nozzles in Section 30, Group 30.)
6. Remove the 14 cylinder head bolts (A) in the order shown.
7. Remove the cylinder head from the engine block.
8. Disassemble and inspect the cylinder head and valves. (See Cylinder Head and Valves Disassembly and Assembly in Section 30, Group 30.)

A—Cylinder Head Bolt (14 used)



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LVAL13811—UN—18NOV10

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OUO1023,0002EEC -19-10FEB11-1/2

Installing:

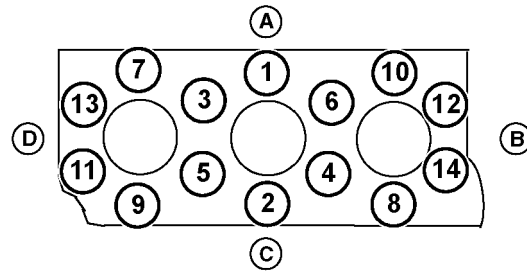
1. Reassemble the cylinder head and valves. (See Cylinder Head and Valves Disassembly and Assembly in Section 30, Group 30.)

IMPORTANT: Avoid Damage! The oil passage in the gasket must be located over the oil passage in cylinder block.

2. Place a new cylinder head gasket on the engine block. Dowels in the engine block assist in aligning the gasket.
3. Place the cylinder head on the engine block. Dowels in the engine block again assist in alignment.
4. Dip the head bolts in new engine oil. Install and tighten in the sequence shown, in three stages of gradually-increasing torque. Tighten the head bolts to specification.

Specification

Cylinder Head	
Bolts—Initial Torque.....	42—47 N·m (31—35 lb.-ft.)
Cylinder Head	
Bolts—Intermediate	
Torque.....	65—70 N·m (48—52 lb.-ft.)
Cylinder Head	
Bolts—Final Torque.....	85—91 N·m (63—67 lb.-ft.)



Cylinder Head Bolt- Tightening Order

A—Exhaust Manifold Side
B—Timing Gear End

C—Intake Manifold Side
D—Flywheel End

IMPORTANT: Avoid Damage! Cylinder head bolts must be checked for proper torque after 50 hours of engine operation.

1. Install the fuel injection nozzles. (See Fuel Injection Nozzles in Section 30, Group 30.)
2. Install the water pump.
3. Install the exhaust and intake manifolds. (See Exhaust Manifold and Intake Manifold in Section 30, Group 30.)
4. Install the rocker arm assembly, push rods and valve caps.

OUO1023,0002EEC -19-10FEB11-2/2

LVAL13812—UN—14JAN11

Cylinder Head and Valves Disassembly and Assembly

Removing:

1. Remove the valve caps from the valves. The valve caps should be installed on the valves they were removed from.
2. Compress the valve spring using a valve spring compressor and remove the collet halves, retainer, valve spring, and valve stem seal for each valve.
3. The intake and exhaust valve guides are press fit. Replace the guides only if necessary. (See [Valve Guides](#) in Section 30, Group 30.)

NOTE: The valve seats are not replaceable. If inspection of the cylinder head reveals valve seats that are damaged or worn beyond repair, the cylinder head must be replaced. See [Valve Seats](#) in Section 30, Group 30 for inspecting valve seats.

4. Inspect remaining parts for wear or damage.

Installing:

IMPORTANT: Avoid Damage! Replace stem seals if removed. Used seals will leak.

1. Install new valve stem seals over the valve guides.
2. Apply clean engine oil on intake and exhaust valve stems during assembly.
3. Install the valve springs with smaller pitch end or paint mark toward cylinder head.
4. Compress the valve springs and retainer until the collet halves can be installed in the grooves of the valve stem.
5. Carefully release the tension on the spring compressor.
6. Tap on the end of the valve with a plastic hammer to ensure that the collet halves have seated on the valve stem.
7. Repeat for the remaining valves.

NOTE: After each valve has been assembled, seat the retainer with a tap on top of valve stem with a plastic hammer.

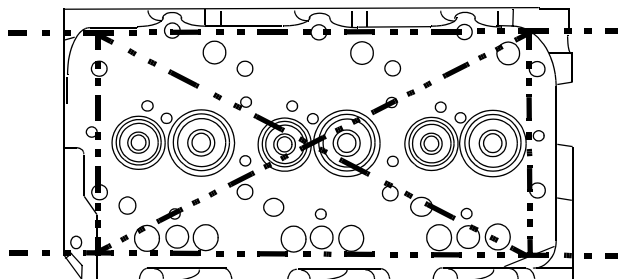
8. Measure valve recession if new valves were installed. (See [Valve Recession](#) in Section 30, Group 30.)

Inspection/Replacement:

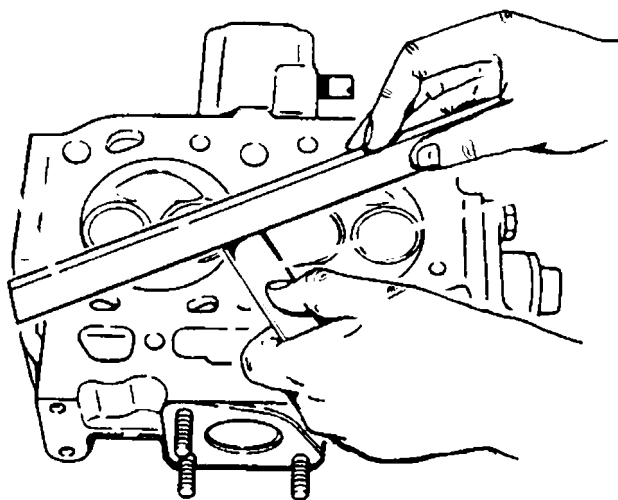
Before inspection, thoroughly clean all components of carbon or dirt.

Cylinder Head:

1. To measure the cylinder head flatness, place a straightedge along each of the four sides and each



LVAL13813 —UN—18NOV10



LVAL13814 —UN—18NOV10

diagonal. Measure clearance between straight edge and combustion surface with a feeler gauge.

- Standard distortion is **0.05 mm (0.002 in.)** or less.
- If the distortion exceeds **0.05 mm (0.002 in.)**, but is less than **0.15 mm (0.006 in.)** resurface the cylinder head.
- If the distortion is **0.15 mm (0.006 in.)** or more, replace the cylinder head.

2. If the cylinder head was resurfaced:

- Measure piston-to-cylinder head clearance. (See [Measure Piston-To-Cylinder Head Clearance](#) in Section 20, group 30.)
- Measure valve recession. (See [Valve Recession](#) in Section 30, Group 30.)
- Measure valve seat width. (See [Valve Seats](#) in Section 30, Group 30.)

Valve Seats

1. Measure the valve seat widths.

Specification

Valve Seat—Width..... 1.07—1.24 mm
(0.042—0.049 in.)

Valve Seat—Wear

Limit—Width..... 1.74 mm
(0.069 in.)

2. Measure exhaust valve seats.

Specification

Exhaust Valve

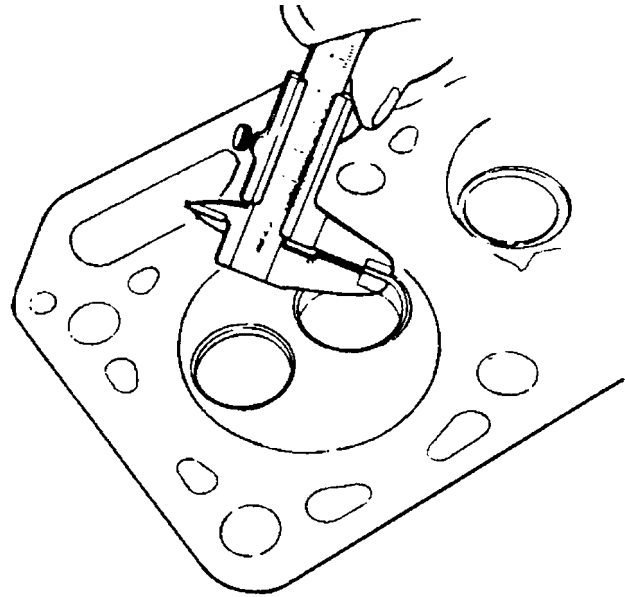
Seat—Width..... 1.24—1.45 mm
(0.049—0.057 in.)

Exhaust Valve

Seat—Wear

Limit—Width..... 1.94 mm
(0.076 in.)

3. If necessary, grind the valve seats to specifications.
(See Grind Valve Seats in Section 30, Group 30.)



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Intake and Exhaust Valves:

1. Check the valves for out-of-round, bent, or warped condition using a valve inspection center. Replace valve if necessary.

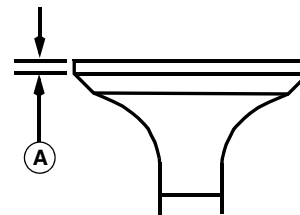


LVAL13816 —UN—18NOV10

OUO1023,0002EEE -19-10FEB11-2/4

2. If the valve faces are worn, burned or pitted, grind the valves to the proper face angle. If the valve head thickness (A) is less than **0.50 mm (0.020 in.)** after grinding, replace the valve.

A—Valve Head Thickness



LVAL13817 —UN—18NOV10

Continued on next page

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3. Measure the valve stem diameter at two locations, as shown.

Specification

Intake Valve Stem—OD.....7.96—7.98 mm
(0.313—0.314 in.)

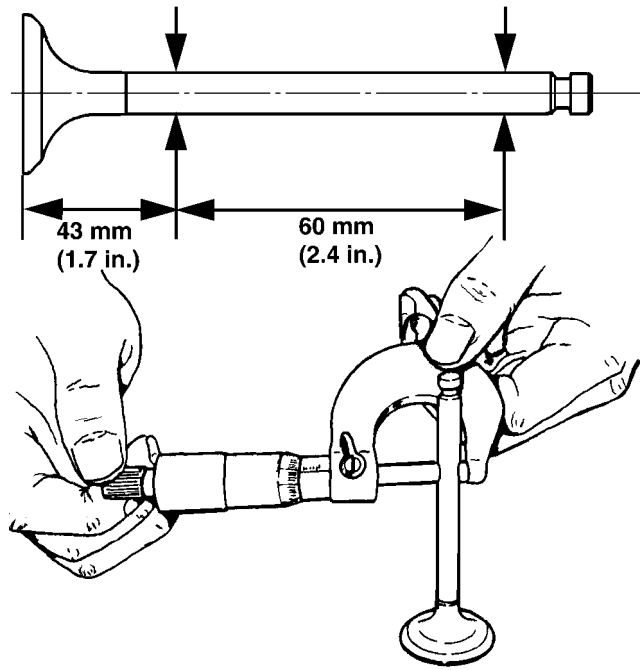
Exhaust Valve
Stem—OD.....7.96—7.97 mm
(0.313—0.314 in.)

- If the valve stem diameter is less than the wear limit, replace the valve.

Specification

Intake Valve Stem—Wear
Limit—OD.....7.90 mm
(0.311 in.)

Exhaust Valve
Stem—Wear Limit—OD.....7.90 mm
(0.311 in.)



LVAL13818 —UN—18NOV10

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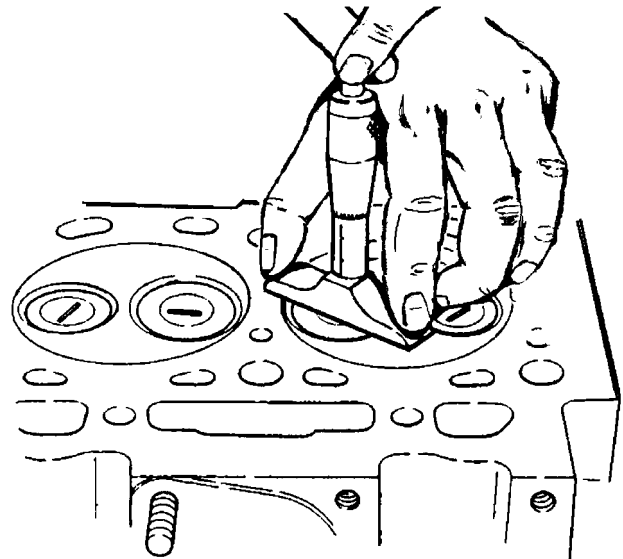
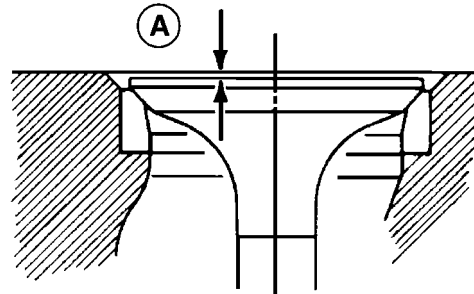
Valve Recession

Measure valve recession (A) using a depth gauge.

Specification

Valve Recession—Re-
cess.....0.3—0.5 mm
(0.012—0.020 in.)

Valve Recession—Wear
Limit—Recess.....0.8 mm
(0.031 in.)



LVAL13819 —UN—18NOV10

OUO1023,0002EEF -19-10FEB11-1/1

Valve Guides

1. Clean the valve guides using a valve guide brush.
2. Measure the valve guide inside diameter.

Specification

Valve Guide—ID.....8.01—8.03 mm
(0.315—0.316 in.)

Valve Guide—Wear
Limit—ID.....8.10 mm
(0.319 in.)

3. Subtract the valve stem outer diameter from the valve guide inner diameter to obtain the oil clearance.

Specification

Intake Valve Stem-To-Guide Oil—Clearance.....0.035—0.07 mm
(0.001—0.003 in.)

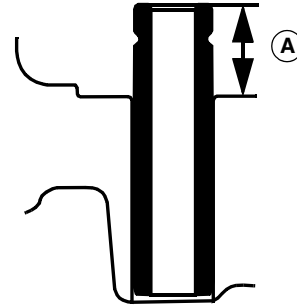
Intake Valve Stem-To-Guide Oil Clearance—Wear
Limit—Clearance.....0.18 mm
(0.007 in.)

Exhaust Valve Stem-To-Guide Oil—Clearance.....0.045—0.07 mm
(0.002—0.003 in.)

Exhaust Valve Stem-To-Guide Oil Clearance—Wear
Limit—Clearance.....0.18 mm
(0.007 in.)

- If the ID of the valve guide is less than the wear limit, determine the guide-to-stem oil clearance (guide diameter minus stem diameter).
- If the oil clearance exceeds **0.15 mm (0.006 in.)** but is less than **0.18 mm (0.007 in.)**, knurl the valve guides using D-20019WI Valve Guide Knurler

4. If clearance exceeds **0.18 mm (0.007 in.)**, replace valve guides using JDE118 Valve Guide Driver.



A—Valve Guide Projection

- New valve guides must be cooled in a container of liquid nitrogen or equivalent before driving into cylinder head.
- The intake and exhaust valve guides are different. The exhaust valve guide has one groove and the intake valve guide has none.
- Install the valve guides with the tapered ends down. Push the valve guides into the cylinder head until the valve guide projection (A) is within specification.

Specification

Valve Guide Projection—Protrusion.....15 mm
(0.591 in.)

- Ream the inside diameter of valve guides using D-20021WI Valve Guide Reamer.

LVAL13820 —UN—18NOV10

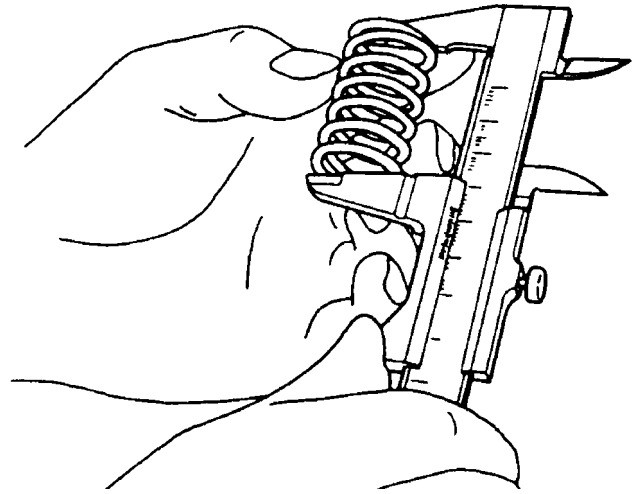
OUO1023,0002EF0 -19-10FEB11-1/1

Valve Springs

1. Measure the valve spring free length.

Specification

Valve Spring Free
Length—Length..... 42 mm
(1.654 in.)

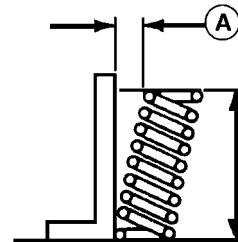
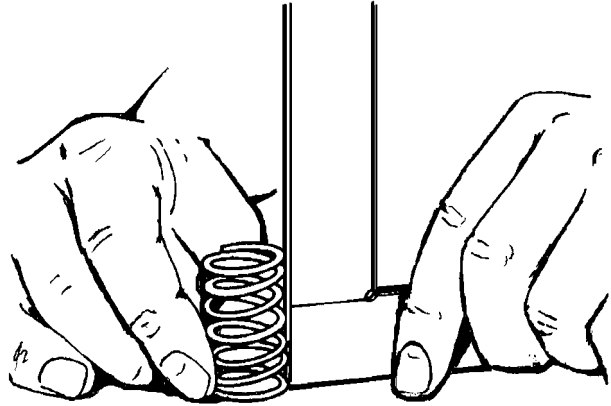


LVAL13821 —UN—18NOV10

OUO1023,0002EF1 -19-10FEB11-1/2

2. Measure the spring inclination (A). Replace the spring if the measurement exceeds **1.40 mm (0.055 in.)**.

A—Spring Inclination



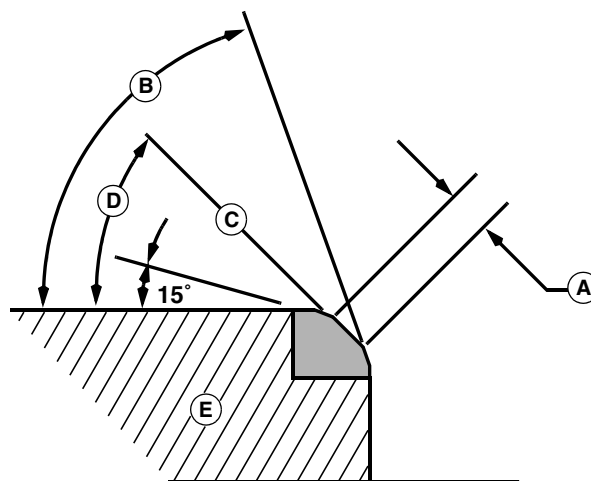
LVAL13822 —UN—18NOV10

OUO1023,0002EF1 -19-10FEB11-2/2

Grind Valve Seats

NOTE: *LIGHTLY grind the valve seats for only a few seconds to avoid excessive valve seat width.*

1. Grind the intake valve seat using a 30° seat grinder and the exhaust valve seat using a 45° seat grinder. Follow the tool manufacturers instructions.
2. Measure the valve seat width after grinding.
3. If the seat width (A) is too wide after grinding, grind the lower seat surface (B) using a 70° seat grinder until the seat width is close to specifications.
4. Grind the upper seat surface (C) using a 15° seat grinder until the seat width is narrowed to specifications.
5. If the valve seats (D) are ground, measure valve recession. (See Cylinder Head and Valves Disassembly and Assembly in Section 30, Group 30.) Check the contact pattern between the seat and valve with bluing dye.
6. Lap the valves. (See Lap Valves in Section 30, Group 30.)



A—Seat Width
B—Lower Seat Surface

C—Upper Seat Surface
D—Valve Seats

7. If the valve recession exceeds the maximum specifications or the seats cannot be reconditioned, replace the valves or the cylinder head.

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LVAL13824—UN—18NOV10

Lap Valves

If the seat does not make proper contact, lap the valve into the seat:

NOTE: *Use a rubber type lapping tool for valves without a lapping tool groove slit.*

1. Apply a small amount of fine lapping compound to the face of the valve.
2. Turn the valve to lap the valve to the seat.
3. Lift the valve from the seat every 8 to 10 strokes. Lap until a uniform ring appears around the surface of the valve face.
4. Wash all parts in solvent to remove lapping compound. Dry all parts.
5. Check the position of the lap mark on the valve face. Lap marks must be on or near the center of the valve face.

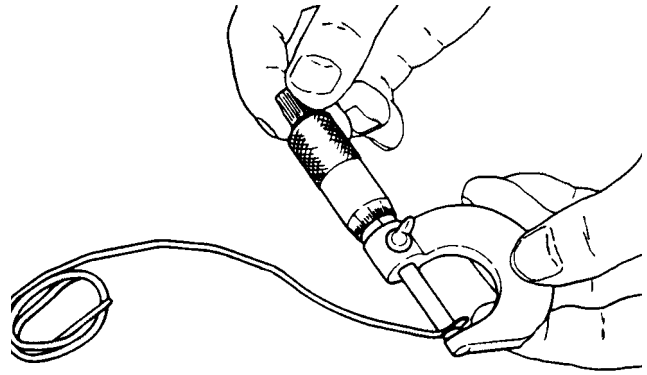


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LVAL13825—UN—30NOV10

Measure Piston-To-Cylinder Head Clearance

1. Place three **10 mm (0.4 in.)** long pieces of **1.5 mm (0.06 in.)** diameter soft wire in three positions on the flat part of the piston head.
2. Install the cylinder head and old gasket. Install cylinder head bolts and tighten in proper sequence. (See Cylinder Head and Valves Removal and Installation in Section 30, Group 30.)
3. Slowly turn the crankshaft one complete revolution.
4. Remove the cylinder head and gasket.
5. Measure the thickness of the flattened section of each piece of wire. Calculate the average thickness of the wires to obtain the piston-to-cylinder head clearance specification. If the clearance is less than specification, replace cylinder head. (See Cylinder Head and Valves Removal and Installation in Section 30, Group 30.)



LVAL13826—UN—18NOV10

Specification

Piston-to-Cylinder Head—Clearance.....	0.64—0.82 mm (0.025—0.032 in.)
---	-----------------------------------

OUO1023,0002EF4 -19-10FEB11-1/1

Piston and Connecting Rod

Removing:

NOTE: The engine must be removed from the machine to perform this procedure.

1. Remove the oil pan, and oil pickup tube.
2. Remove the cylinder head. (See Cylinder Head and Valves Removal and Installation in Section 30, Group 30.)
3. Check the cylinder bore for ridges. These ridges can cause damage to piston if ridge is not removed.
4. If necessary, remove any ridge from the top of the cylinder bore using a ridge reamer.
5. Measure the connecting rod side play. (See Connecting Rod Side Play Check in Section 30, Group 25.)
6. Measure the crankshaft end play. (See Camshaft End Play Check in Section 30, Group 25.)
7. Measure the connecting rod bearing clearance. (See Connecting Rod Bearing Clearance Check in Section 30, Group 25.)

IMPORTANT: Avoid Damage! Keep the connecting rods and rod caps together. Rods and caps are a matched set. Note the alignment marks on each part.

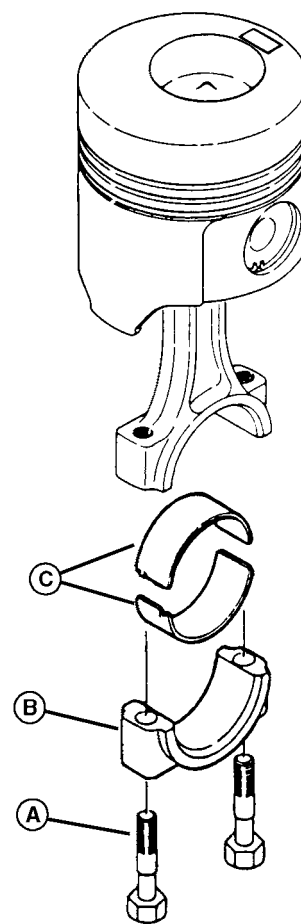
8. Remove the rod bolts (A), connecting rod cap (B) and bearing inserts (C).

IMPORTANT: Avoid Damage! The pistons and cylinders are matched. Pistons must be installed in the cylinders from which they are removed.

9. Note the connecting rod alignment mark in relation to the cylinders. Starting at the flywheel end with cylinder number one, then two, etc.
10. Push the piston and connecting rod out of the cylinder bore using a wooden dowel.
11. Disassemble and inspect all parts for wear or damage.
12. Inspect the cylinder bore. (See Cylinder Bore in Section 30, Group 30.)

Installation:

- Apply clean engine oil to all parts during installation.



A—Rod Bolts
B—Connecting Rod Cap

C—Bearing Inserts

- Always replace the connecting rod bolts. DO NOT reuse the bolts.

IMPORTANT: Avoid Damage! Pistons must be installed in the cylinders from which they were removed and in the same direction. Be careful not to damage the crankshaft rod journals while installing pistons.

1. Assemble the piston and connecting rod.

Continued on next page

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2. Install the piston and connecting rod into the cylinder from which it was removed. The alignment mark on the connecting rod (D) and/or the piston size mark (E) on top of piston should point toward the fuel injection pump.

IMPORTANT: Avoid Damage! Do not touch bearing insert surfaces. Oil and acid from your finger will corrode the bearing surface.

3. Install the bearing inserts to the connecting rod and rod cap, aligning tangs (F) with grooves (G).

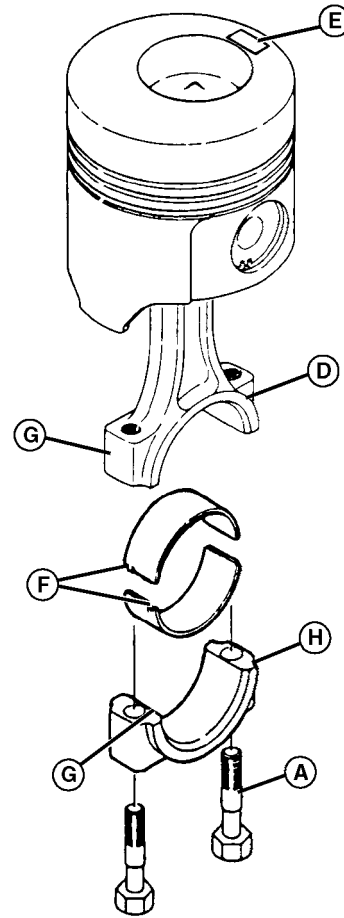
IMPORTANT: Avoid Damage! Connecting rod caps must be installed on the same connecting rods they were removed from.

4. Match the connecting rods to caps using alignment marks (H). Install the rod caps.
5. Dip the entire connecting rod bolt in clean engine oil. Install new bolts and tighten to specification.

Specification

Connecting Rod
Bolt—Torque..... 44—49 N·m
(33—36 lb.-ft.)

6. If a new piston and connecting rod were installed, stamp a number corresponding to the cylinder number on the connecting rod and rod cap.
7. Install the cylinder head. (See Cylinder Head and Valves Removal and Installation in Section 30, Group 30.)
8. Install the oil pan, and oil pickup tube.



D—Connecting Rod
E—Piston Size Mark
F—Aligning Tangs

G—Grooves
H—Alignment Marks

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Continued on next page

OUC1023,0002EF5 -19-19MAY11-2/5

Disassembly:

IMPORTANT: Avoid Damage! Pistons must be installed on the same connecting rod they were removed from.

- Put a mark on each piston and connecting rod to aid in assembly.
- Remove snap rings (I) from piston pin (J) and remove pin.
- The piston pin bushing (K) is a press fit in the connecting rod. Remove the bushing only if replacement is necessary.
- Inspect all parts for wear or damage. Replace as necessary.
- Remove the 1st and 2nd compression rings (L) and oil ring with expander (M).

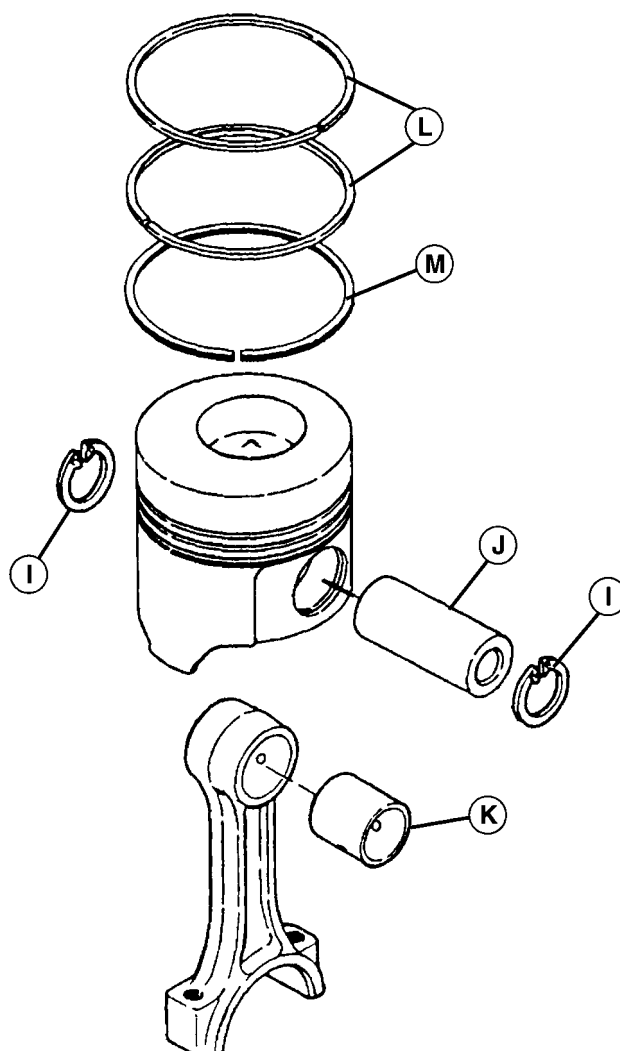
I— Snap Rings

J— Piston Pin

K—Piston Pin Bushing

L— Compression Rings

M—Expander



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OUC1023,0002EF5 -19-19MAY11-3/5

Assembly:

- Apply new engine oil to all parts during assembly.

IMPORTANT: Avoid Damage! The pistons must be installed on the same connecting rod they were removed from.

1. Assemble the piston to the connecting rod with piston mark (E) on the same side as the connecting rod stamped mark (D). If a new connecting rod is used, assemble the piston to the connecting rod with piston mark opposite the connecting rod bearing insert groove (G). Be sure that the oil hole in the piston pin bushing is aligned with the hole in the connecting rod.
2. Install the piston pin (J) and retaining/snap rings (I).
3. Install an oil ring expander in the bottom ring groove of the piston, with the ends above either end of the piston pin.

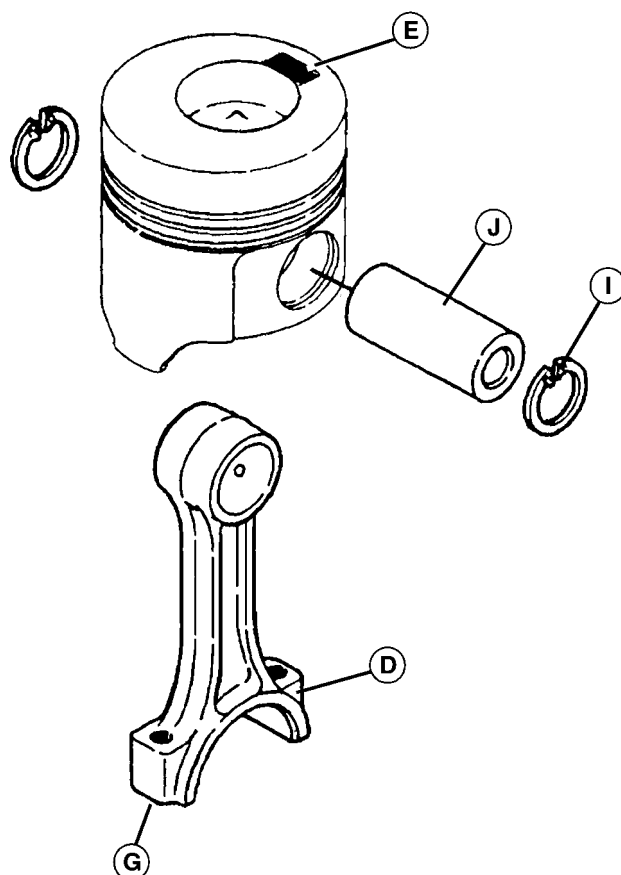
D—Connecting Rod Stamped Mark

I— Snap Rings

E—Piston Mark

J— Piston Pin

G—Bearing Insert Groove



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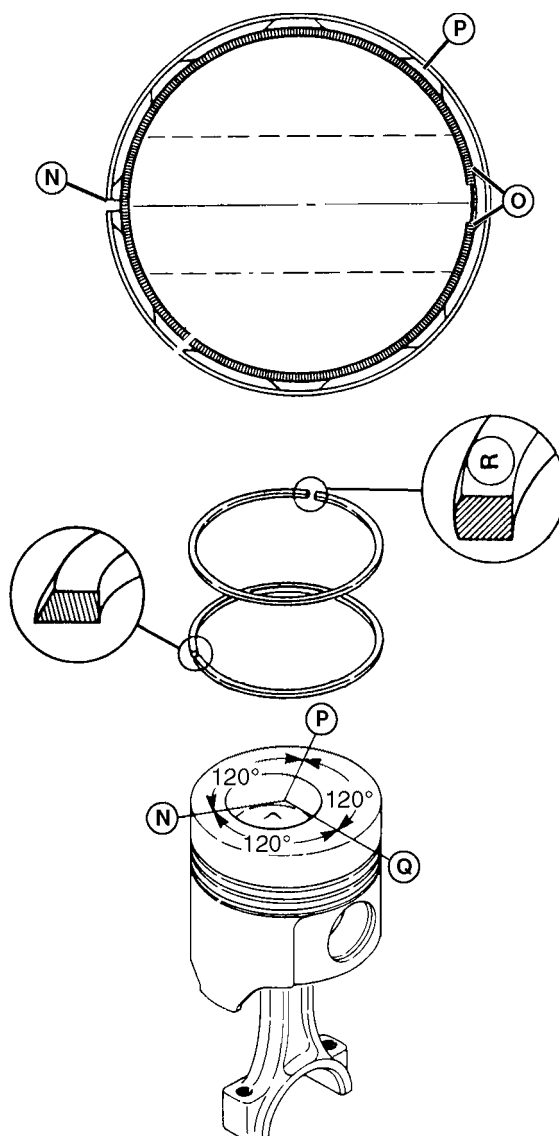
OUC1023,0002EF5 -19-19MAY11-4/5

LVAL13830 —UN—18NOV10

4. Install the oil ring over the expander with the ring gap (N) opposite (180°) of the expander ends (O).
5. Install the second compression ring, with the small diameter of taper toward top of piston, in the middle groove. Turn the ring until the gap (P) is 120° away from the oil ring gap (N).
6. Install the first compression ring (chrome plated), with the manufacturer's mark "R", "T" or "RN" (near the ring gap) toward the top of the piston, in the top groove. Turn the ring until the gap (Q) is 120° away from the second ring gap.

N—Oil Ring Gap
O—Expander Ends

P—Gap
Q—Gap



LVAL13831—UN—30NOV10

LVAL13832—UN—30NOV10

OUO1023,0002EF5 -19-19MAY11-5/5

Piston Inspection

Connecting Rod Bearing:

1. Install the connecting rod cap and bearing inserts on the connecting rod. Install the old connecting rod bolts and tighten to specification.

Specification

Connecting Rod
Bolt—Torque..... 44—49 N·m
(33—36 lb.-ft.)

2. Measure the connecting rod bearing diameter. Replace the bearing inserts if the bearing diameter is not within specification.

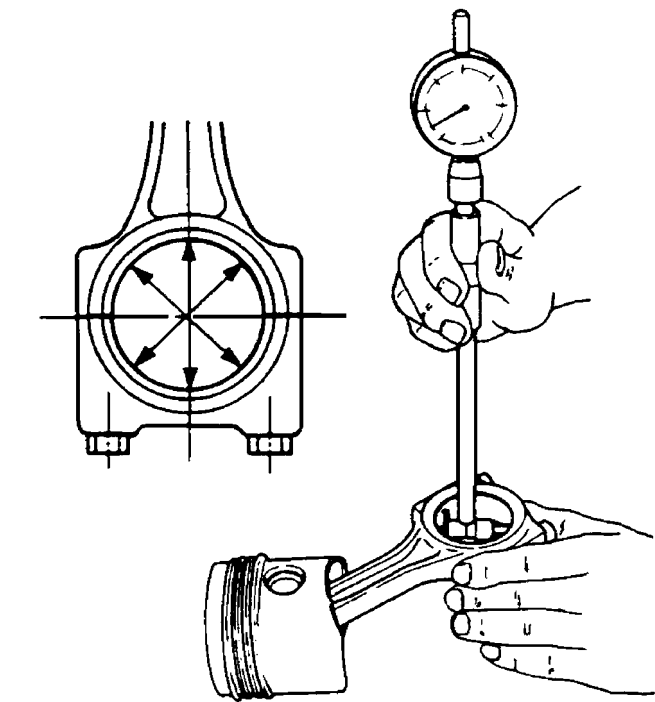
Specification

Connecting Rod
Bearing—ID..... 47.952—47.962 mm
(1.8878—1.8882 in.)

3. Measure the oil clearance between the bearing inserts and the crankshaft, and verify that the clearance is within specification. If the bearing oil clearance exceeds the wear limit, grind the crankshaft connecting rod journals and install undersized bearing inserts, or replace the bearing inserts and the crankshaft.

Specification

Connecting Rod Bearing
Oil—Clearance..... 0.038—0.074 mm
(0.001—0.003 in.)



Connecting Rod Bearing

Oil Clearance—Wear

Limit—Clearance..... 0.15 mm
(0.006 in.)

OUO1023,0002EF6 -19-10FEB11-1/7

LVAL13833 —UN—18NOV10

Piston Ring Groove:

1. With the rings installed on the piston, measure the piston ring groove side clearance. Measure at several places around each piston.
2. Replace the rings or the piston if the clearances exceed specification.

Specification

First Compression
Ring Groove—Side
Clearance..... 0.08—0.11 mm
(0.003—0.004 in.)

Second Compression Ring
Groove,—3TNV88—Side
Clearance..... 0.04—0.07 mm
(0.001—0.003 in.)

Second Compression Ring
Groove,—3TNV84—Side
Clearance..... 0.05—0.08 mm
(0.002—0.003 in.)



Oil Control Ring

Groove—Side

Clearance..... 0.03—0.06 mm
(0.001—0.002 in.)

Continued on next page

OUO1023,0002EF6 -19-10FEB11-2/7

LVAL13834 —UN—18NOV10

Piston Ring End Gap:

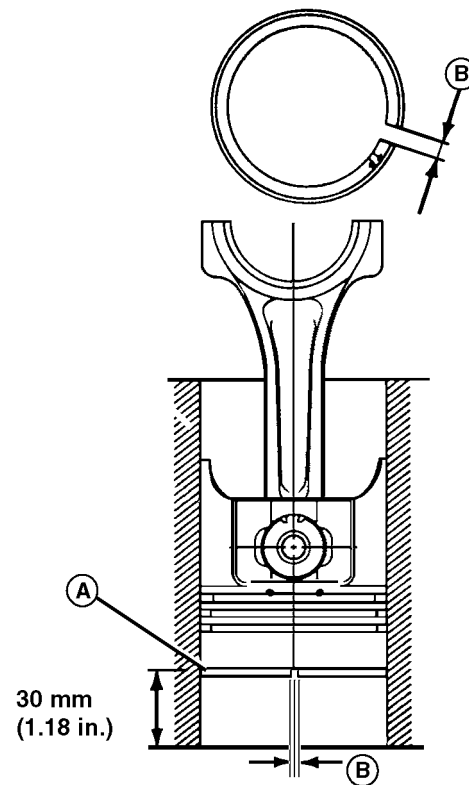
1. Use a piston to push the ring (A) approximately **30 mm (1.18 in.)** from the bottom of the cylinder bore.
2. Measure the piston ring end gap (B).

Specification

Piston Ring End	
Gap—Gap.....	0.20—0.40 mm (0.008—0.016 in.)
Piston Ring End	
Gap—Wear Limit—Gap.....	1.50 mm (0.059 in.)

A—Ring

B—Gap



OUO1023,0002EF6 -19-10FEB11-3/7

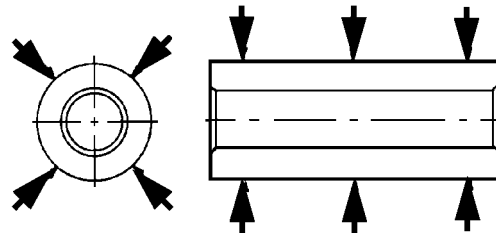
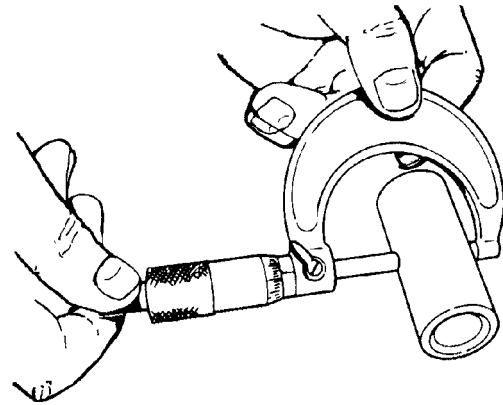
LVAL13835—UN—30NOV10

Piston Pin Diameter:

1. Measure the piston pin diameter. Measure the diameter at six places.
2. Replace any pin not within specification.

Specification

Piston Pin—OD.....	25.99—26.00 mm (1.023—1.024 in.)
Piston Pin—Wear	
Limit—OD.....	25.90 mm (1.020 in.)



Continued on next page

OUO1023,0002EF6 -19-10FEB11-4/7

LVAL13836—UN—30NOV10

Piston Pin Bore:

1. Measure the pin bore diameter in the piston.

Specification

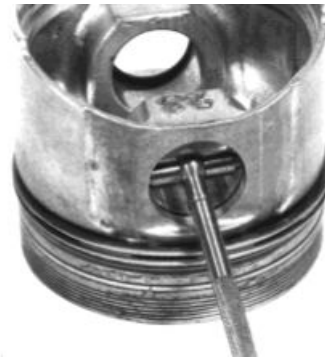
Piston Pin	
Bore—Diameter—Inner.....	26.00—26.01 mm (1.023—1.024 in.)
Piston Pin Bore—Wear	
Limit—ID.....	26.04 mm (1.025 in.)

2. Piston pin-to-piston oil clearance is the bore inner diameter minus the pin outer diameter.

Specification

Piston Pin-to-Piston—Oil	
Clearance.....	0.00—0.02 mm (0.00—0.001 in.)
Piston Pin-to-Piston	
Oil Clearance—Wear	
Limit—Clearance.....	0.12 mm (0.005 in.)

- If the piston pin bore exceeds the wear limit, replace the piston.
- If the piston pin is less than the wear limit, replace the piston pin.
- If the bore clearance exceeds the wear limit replace the piston, piston pin or both.



LVAL13837 —UN—30NOV10

OUO1023,0002EF6 -19-10FEB11-5/7

Piston Pin Bushing:

1. Measure the piston pin bushing diameter in the connecting rod. If the bushing diameter exceeds the wear limit, replace bushing.

Specification

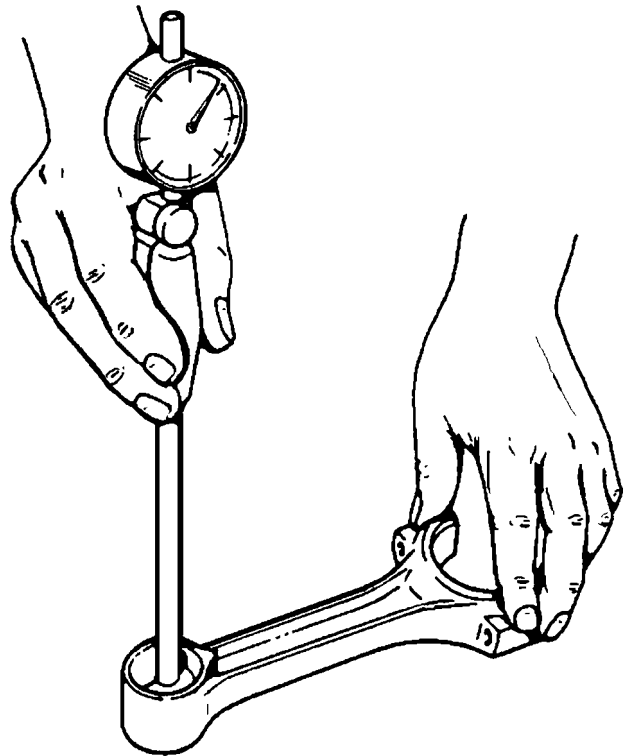
Piston Pin Bushing—ID.....	26.03—26.04 mm (1.025—1.025 in.)
Piston Pin	
Bushing—Wear	
Limit—ID.....	26.10 mm (1.028 in.)

NOTE: The piston pin bushing is a press fit. Replace the bushing using a driver set. When installing the bushing, make sure to align the oil hole in the bushing with the hole in the connecting rod.

2. Piston pin-to-rod bore oil clearance is the bore inner diameter minus the pin outer diameter. If the bushing clearance (bushing inner diameter minus pin outer diameter) exceeds specification replace the bushing or the piston pin.

Specification

Piston Pin-to-Rod	
Bore—Oil Clearance.....	0.03—0.05 mm (0.001—0.002 in.)
Piston Pin-to-Rod Bore	
Oil Clearance—Wear	
Limit—Clearance.....	0.20 mm (0.008 in.)



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Continued on next page

OUO1023,0002EF6 -19-10FEB11-6/7

Piston Diameter:

NOTE: If the engine has had a previous overhaul, oversize pistons and rings may have been installed. Pistons and rings are available in 0.25 mm (0.010 in.) oversize.

1. Measure the piston diameter perpendicular to the piston pin bore **23 mm (0.905 in.)** from the bottom of the piston skirt.
2. If the piston diameter is less than the wear limit, install a new piston.

Specification

Standard

Piston—3TNV84—OD.....83.95—83.98 mm
(3.305—3.306 in.)

Standard Piston Wear

Limit—3TNV84—OD.....83.90 mm
(3.303 in.)

Standard

Piston—3TNV88—OD.....87.95—87.98 mm
(3.462—3.464 in.)

Standard Piston Wear

Limit—3TNV88—OD.....87.90 mm
(3.461 in.)

Standard Piston, Over-

size—3TNV84—OD.....84.20—84.23 mm
(3.315—3.316 in.)

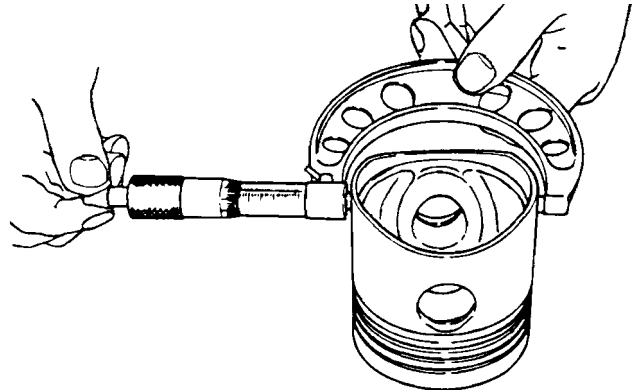
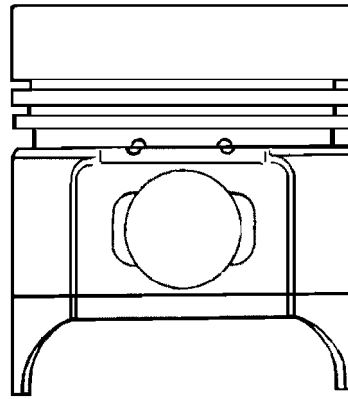
Standard Piston,

Oversize Wear

Limit—3TNV84—OD.....84.10 mm
(3.311 in.)

Standard Piston, Over-

size—3TNV88—OD.....88.20—88.23 mm
(3.472—3.474 in.)

Standard Piston,
Oversize Wear

Limit—3TNV88—OD.....88.10 mm
(3.469 in.)

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LVAL13840 —UN—18NOV10

OUO1023,0002EF6 -19-10FEB11-77

Cylinder Bore

NOTE: If the engine has had a previous overhaul, the cylinders may have been bored oversize. Pistons and rings are available in 0.25 mm (0.010 in.) oversize.

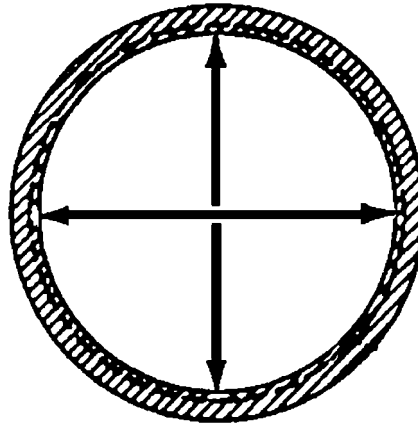
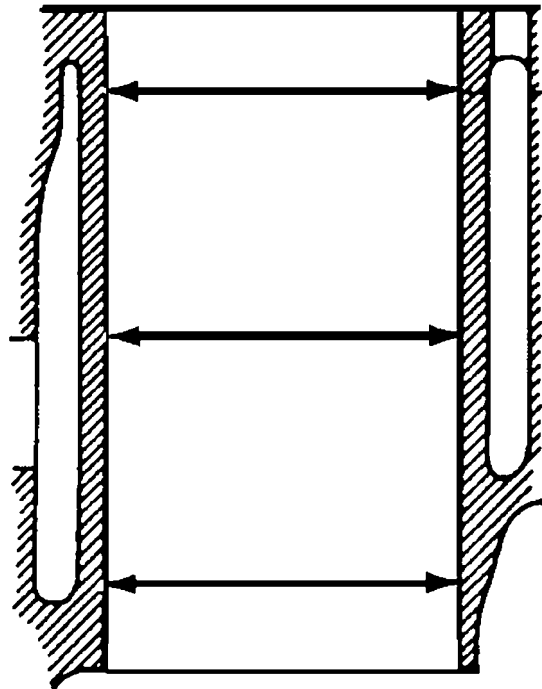
1. Measure the cylinder bore diameter at the top, middle, and bottom. At these three positions, measure in both directions; along the crankshaft center line and the direction of the crankshaft rotation.

Specification

Cylinder	
Bore—3TNV84—ID.....	84.00—84.03 mm (3.307—3.308 in.)
Cylinder Bore Wear	
Limit—3TNV84—ID.....	84.20 mm (3.315 in.)
Cylinder	
Bore—3TNV88—ID.....	88.00—88.03 mm (3.465—3.466 in.)
Cylinder Bore Wear	
Limit—3TNV88—ID.....	88.20 mm (3.472 in.)
Oversize	
Bore—3TNV84—ID.....	84.25—84.28 mm (3.317—3.318 in.)
Oversize	
Bore—3TNV88—ID.....	88.25—88.28 mm (3.474—3.476 in.)
Piston-to-Cylinder	
Clearance—ID.....	0.040—0.070 mm (0.0016—0.0027 in.)
Cylinder Round-	
ness—Out-of-Round.....	0.01—0.03 mm (0—0.001 in.)
Cylinder Round-	
ness—Wear Limit—Out-	
of-Round.....	0.03 mm (0.001 in.)
Cylinder Angle—Taper.....	
	0.00—0.01 mm (0—0.0004 in.)
Cylinder Taper—Wear	
Limit—Angle.....	0.03 mm (0.001 in.)

2. Perform the following based on measurement results:

- If the cylinder bore standard ID exceeds the wear limit, have the cylinder rebored.
- If the cylinder is rebored, oversize pistons and rings must be installed.
- If the cylinder bore exceeds the oversize bore ID, replace the cylinder block.



- If the piston-to-cylinder bore clearance (cylinder bore ID minus piston OD) exceeds specification, replace the cylinder block, piston or both; or rebore cylinder and install oversize piston and rings.
- Slight uneven wear, flaws, or minor damage may be corrected by deglazing.

Continued on next page

OOU01023,0002EF7 -19-10FEB11-1/3

LVAL13841 —UN—18NOV10

Deglazing:

IMPORTANT: Avoid Damage! If the cylinder bores are to be deglazed with crankshaft installed in engine, put clean shop towels over crankshaft to protect journal and bearing surfaces from any abrasives.

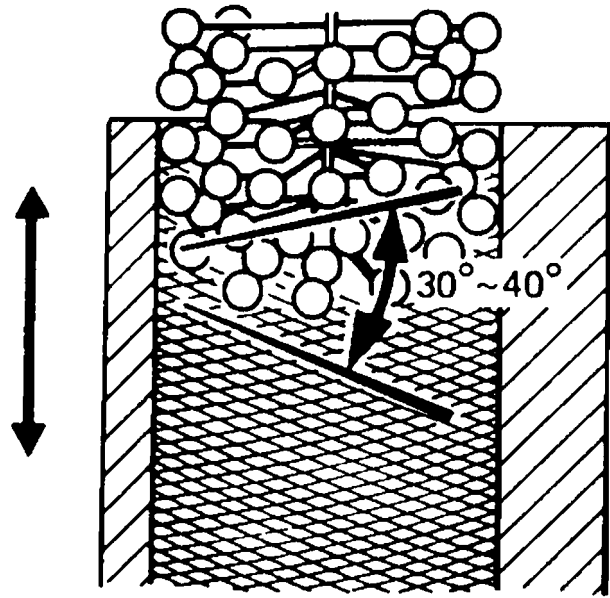
1. Deglaze the cylinder bores using a flex-hone with 180 grit stones.
2. Use the flex-hone as instructed by the manufacturer to obtain a **30—40° crosshatch pattern** as shown.

Specification

Cylinder—Deglazing—Surface Finish.....30—40° crosshatch pattern

IMPORTANT: Avoid Damage! Do not use gasoline, kerosene, or commercial solvents to clean cylinder bores. Solvents will not remove all abrasives from cylinder walls.

3. Remove excess abrasive residue from the cylinder walls using a clean dry rag. Clean the cylinder walls using clean white rags and warm soapy water.



Continue to clean the cylinder until white rags show no discoloration.

Continued on next page

OUC1023,0002EF7 -19-10FEB11-2/3

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Reboring:

NOTE: The cylinder block can be rebored to use oversize pistons and rings. Pistons and rings are available in 0.25 mm (0.010 in.) oversize.

1. Align the center of bore to the drill press center.

IMPORTANT: Avoid Damage! Check stone for wear or damage. Use a rigid hone with 300 grit stones.

2. Adjust the hone so the lower end is even with the lower end of cylinder bore.
3. Adjust the rigid hone stones until they contact the narrowest point of the cylinder.
4. Coat the cylinder with honing oil. The hone should turn by hand. Adjust the hone if it is too tight.
5. Run the drill press at about 250 rpm. Move the hone up and down in order to obtain a **30—40° crosshatch pattern**.

Specification

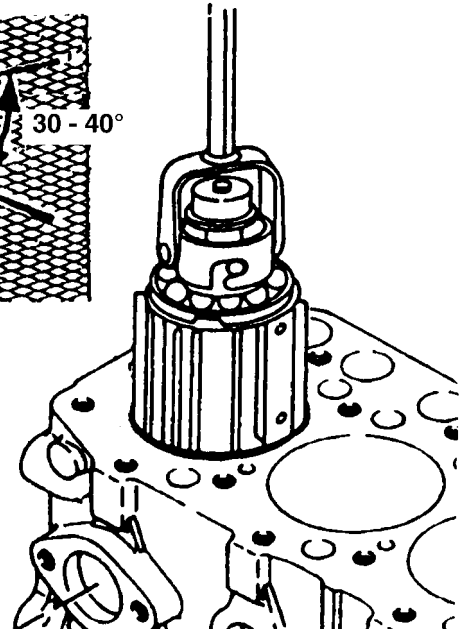
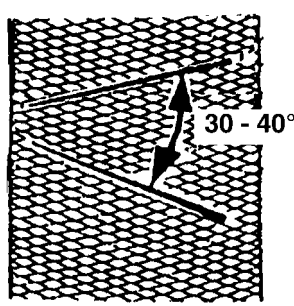
Cylinder—Debor-
ing—Surface Finish.....30—40° crosshatch pattern

NOTE: Measure the bore when the cylinder is cool.

6. Stop the press and check the cylinder diameter.

NOTE: Finish should not be smooth. It should have a 30—40° crosshatch pattern.

7. Remove the rigid hone when the cylinder is within **0.03 mm (0.001 in.)** of desired size.
8. Use a flex hone with 180 grit stones for honing to final size.



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9. Check the bore for size, taper and out-of-round. See inspection procedures.

IMPORTANT: Avoid Damage! Do not use solvents to clean the cylinder bores. Solvents will not remove all the metal particles and abrasives produced during honing.

10. Clean the cylinder thoroughly using warm soapy water until clean white rags show no discoloration.
11. Dry the cylinder and apply engine oil.

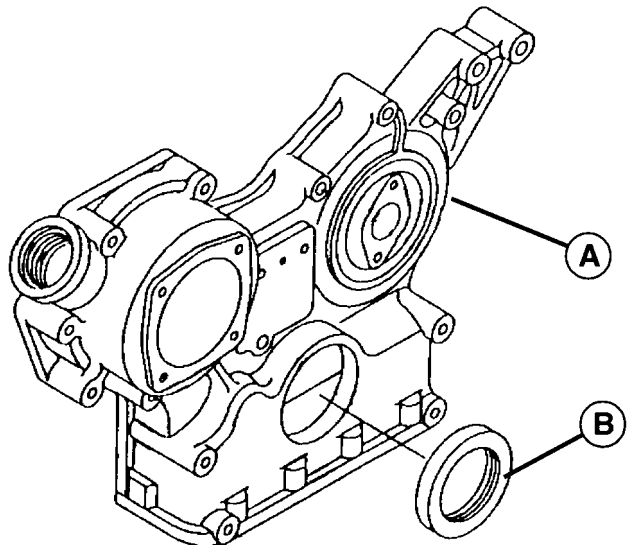
OUO1023,0002EF7 -19-10FEB11-3/3

Crankshaft Front Oil Seal

1. Remove the timing gear cover (A). (See Timing Gear Cover in Section 30, Group 30.)
2. Replace the oil seal (B). Install new seal with the lip toward inside of gear housing cover, flush with the surface of the cover.

A—Timing Gear Cover

B—Oil Seal



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OUO1023,0002EF8 -19-10FEB11-1/1

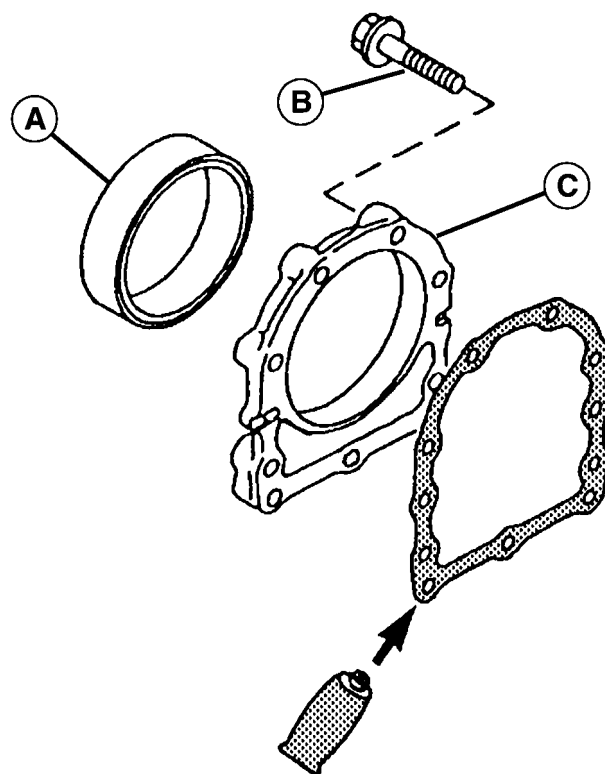
Crankshaft Rear Oil Seal

Replacement:

1. Split the machine between the flywheel housing and the tunnel. See "Machine Splitting—Front" in the appropriate power train section.
2. Remove the drive coupling.
3. Remove flywheel. (See [Flywheel and Coupling](#) in Section 30, Group 30.)
4. Remove the rear oil seal (A), case-to-crankcase extension cap screws and the oil seal case-to-crankcase cap screws (B).
5. Remove the rear oil seal case (C).
6. Replace the oil seal using an appropriate seal driver, with the lip toward the cylinder block, flush with the surface of the oil seal case.

NOTE: If the crankshaft is grooved at the oil seal contact point, the seal can be installed 3 mm (0.12 in.) farther into the oil seal case.

7. Install the oil seal case to the crankcase and crankcase extension.



A—Rear Oil Seal
B—Cap Screws

C—Rear Oil Seal Case

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OUO1023,0002EF9 -19-10FEB11-1/1

Crankshaft and Main Bearings

Removing:

1. Check the crankshaft end play. (See Crankshaft End Play Check in Section 30, Group 25.)
2. Remove the cylinder head. (See Cylinder Head and Valves Removal and Installation in Section 30, Group 30.)
3. Remove the rear oil seal. (See Crankshaft Rear Oil Seal in Section 30, Group 30.)
4. Remove the timing gear cover mounting plate. (See Timing Gear Cover in Section 30, Group 30.)
5. Check the crankshaft rod bearing clearance. (See Connecting Rod Bearing Clearance Check in Section 30, Group 25.)

IMPORTANT: Avoid Damage! Connecting rod caps must be installed on the same connecting rods from which they were removed. Note the alignment marks on the caps and rods.

6. Check the crankshaft main bearing clearance. (See Crankshaft Main Bearing Clearance Check in Section 30, Group 25.)

IMPORTANT: Avoid Damage! Main bearing caps must be installed on the same main bearings from which they were removed.

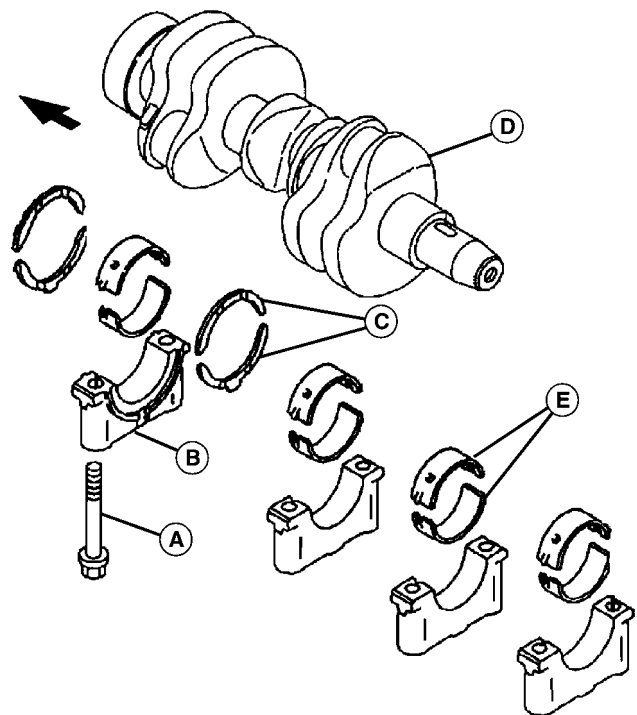
7. Remove the connecting rod bolts and rod caps. Discard the connecting rod bolts.
8. Push the pistons and connecting rods away from crankshaft.
9. Remove the main bearing bolts (A), caps (B) and cap thrust bearings (C).
10. Remove the crankshaft (D).
11. Remove the block thrust bearings and main bearing inserts (E).
12. Inspect all parts for wear or damage.

Installing:

NOTE: Apply clean engine oil to all parts during installation.

IMPORTANT: Avoid Damage! Do not touch bearing insert surfaces. Oil and acid from your finger will corrode the bearing surface.

1. Install the grooved bearing inserts in the crankshaft bearing bores, aligning the tangs with the slots in the bores.
2. Install the block thrust bearings with the oil grooves facing away from the engine block.
3. Install the crankshaft.



A—Main Bearing Bolts
B—Caps
C—Cap Thrust Bearings

D—Crankshaft
E—Main Bearing Inserts

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4. Install the bearing inserts in the main bearing caps, aligning the tangs with the slots in the caps.

NOTE: The main bearing caps have "raised arrows" that are stamped with numbers. Both correspond to their location on the engine block. Install all bearing caps with the "arrow" toward the flywheel end of the engine. Install the bearing caps beginning with the thrust bearing cap (no number), number 1, then 2, etc. The main bearing cap at the gear train end does not have a number.

5. Install the thrust bearings, with the oil grooves facing away from the cap, in the number "1" main bearing cap.
6. Install the main bearing caps in their original locations with arrows pointing toward the flywheel side of the engine.

IMPORTANT: Avoid Damage! DO NOT use power tools or air wrenches to tighten main bearing bolts.

7. Dip each main bearing bolt entirely in clean engine oil. Install the bolts and tighten. DO NOT tighten to specifications.
8. Using a soft-faced hammer, tap the front end of the crankshaft then the rear end of the crankshaft to align the thrust bearings.

Continued on next page

OUC1023,0002EFA -19-10FEB11-1/6

9. Tighten the main bearing bolts to specification. When tightening, start at the center main bearing cap and work your way out, alternating to the ends. Turn the crankshaft by hand. If it does not turn easily, disassemble the parts and find the cause.

Specification

Main Bearing

Bolt—Torque..... 93—98 N·m
(69—72 lb.-ft.)

IMPORTANT: Avoid Damage! The connecting rod caps must be installed on the same connecting rods they were removed from. Never reuse connecting rod bolts, replace with new.

10. Match the connecting rod caps to the rods using alignment marks. Install the caps to the rods.
11. Dip entire connecting rod bolt in new engine oil. Install new bolts to the rods, and tighten to specification.

Specification

Connecting Rod

Bolt—Torque..... 44—49 N·m
(33—36 lb.-ft.)

12. Install the timing gear cover mounting plate. (See Timing Gear Cover Mounting Plate in Section 30, Group 30.)
13. Install the rear oil seal. (See Crankshaft Rear Oil Seal in Section 30, Group 30.)
14. Install the flywheel. (See Flywheel and Coupling in Section 30, Group 30.)
15. Install the timing gear cover. (See Timing Gear Cover in Section 30, Group 30.)
16. Install the front oil seal. (See Crankshaft Front Oil Seal in Section 30, Group 30.)
17. Install the oil pan.

Inspection/Replacement:

- Inspect the crankshaft gear for chipped or broken teeth. Replace if necessary.

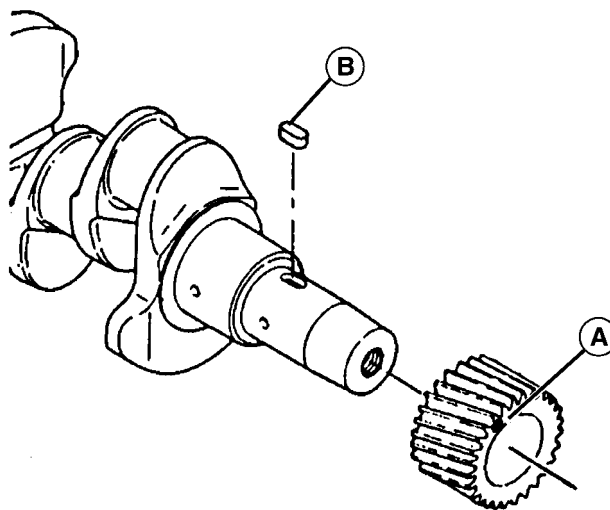
OUO1023,0002EFA -19-10FEB11-2/6

To Replace Gear:

- Remove the gear from crankshaft using a knife-edge puller and a press.
- Heat new gear to approximately 150 °C (302 °F). Install gear with timing mark (A) toward press table. Align slot in gear with key (B) in shaft. Press crankshaft into gear until gear is tight against crankshaft shoulder.

A—Timing Mark

B—Key



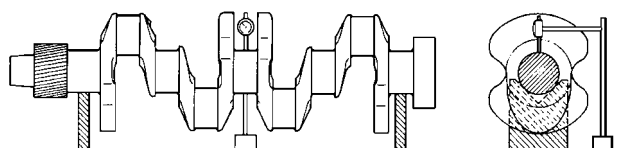
LVAL13847 —UN—18NOV10

OUO1023,0002EFA -19-10FEB11-3/6

CAUTION: Avoid Injury! DO NOT heat oil over 182 °C (360 °F). Oil fumes or oil can ignite above 193 °C (380 °F). Use a thermometer. Do not allow a flame or heating element to come in direct contact with the oil. Heat the oil in a well-ventilated area. Plan a safe handling procedure to avoid burns.

3. Inspect the crankshaft for bend using V-blocks and a dial indicator. Turn the crankshaft slowly and read

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variations on the indicator. If the variation is greater than **0.02 mm (0.001 in.)**, replace the crankshaft.

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OUO1023,0002EFA -19-10FEB11-4/6

4. Measure the crankshaft connecting rod journal and main bearing journal diameters at several places around each journal.

- If the journal diameter (C) is less than the specification, but greater than the wear limit, have the journals ground undersize by a qualified machine shop.

Specification

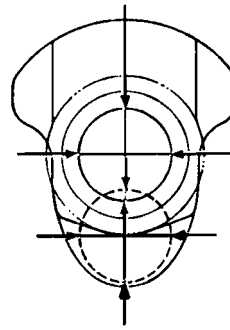
Connecting Rod
Journal—OD.....47.95—47.96 mm
(1.888—1.888 in.)

Connecting Rod
Journal—Wear
Limit—OD.....47.91 mm
(1.886 in.)

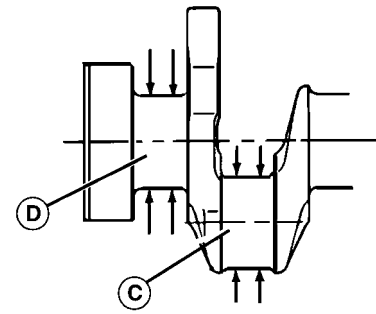
Main Bearing
Journal—OD.....53.95—53.96 mm
(2.124—2.124 in.)

Main Bearing
Journal—Wear
Limit—OD.....53.91 mm
(2.122 in.)

- If journals are ground, undersize bearing inserts must be installed. Bearing inserts are available in **0.25 mm (0.010 in.)** undersize.
- If the journal diameter is less than the wear limit, replace the crankshaft.



C—Connecting Rod Journal Diameter



D—Main Bearing Journal Diameter

5. Install the bearing inserts and main bearing caps on the main bearings. Tighten the main bearing bolts to specification.

Specification

Main Bearing
Bolt—Torque.....93—98 N·m
(69—72 lb.-ft.)

6. Measure the main bearing inner diameter. Subtract the main bearing journal outer diameter of the crankshaft from the main bearing inner diameter to obtain the main bearing oil clearance.

Specification

Main Bearing —Oil
Clearance.....0.04—0.07 mm
(0.002—0.003 in.)

Main Bearing Oil
Clearance—Wear
Limit—Clearance.....0.15 mm
(0.006 in.)

7. Perform the following based on measurement results:

- If the crankshaft is within specification, but the main bearing oil clearance exceeds the wear limit, replace the bearing inserts.
- If the crankshaft is not within specification, have crankshaft journals ground undersize by a qualified machine shop and install undersized bearing inserts.
- If the crankshaft is worn past the wear limit, replace the crankshaft.

8. Clean and inspect the oil passages in the main bearing journals, connecting rod journals, and main bearing bores in cylinder block.

9. Inspect the crankshaft for cracks or damage. Replace if necessary.



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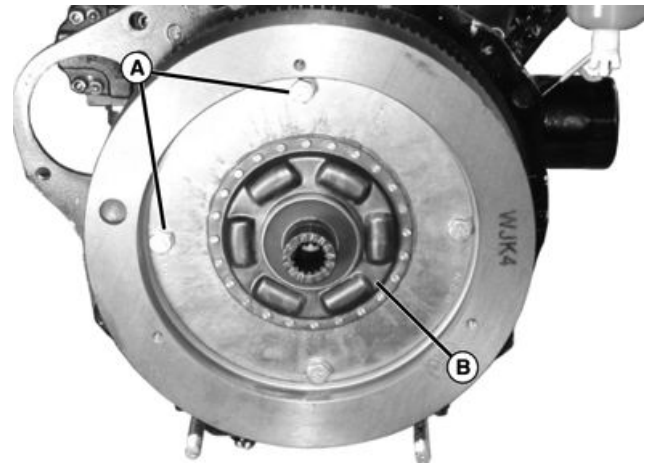
LVAL13850 —UN—18NOV10

Flywheel and Coupling

Removal/Installation:

IMPORTANT: Avoid Damage! Always install new flywheel mounting bolts.

1. Split the machine between the flywheel housing and the tunnel. See "Machine Splitting—Front" in the appropriate power train section.
2. Mark coupling (B) as to which side faces flywheel for proper reassembly.
3. Remove four coupling cap screws (A) and remove coupling (B) from the flywheel.



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OUO1023,0002EFB -19-10FEB11-1/2

A—Cap Screw (4 used)

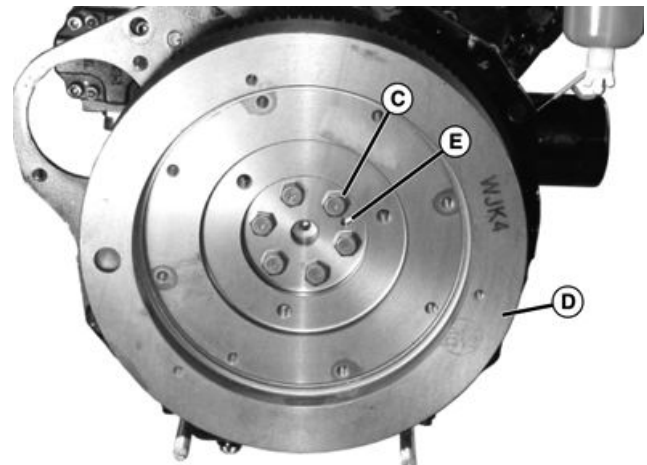
B—Coupling

4. Remove the flywheel mounting cap screws (C) and remove the flywheel (D) from crankshaft.
5. Dowel pin (E) in the crankshaft correctly locates the flywheel on the crankshaft.
6. Install the flywheel. Apply lubrication oil to the flywheel bolts. Tighten to specification.

Specification

Coupling Cap	
Screws—Torque.....	83—88 N·m (62—65 lb.-ft.)
Flywheel Cap	
Screws—Torque.....	83—88 N·m (62—65 lb.-ft.)

7. Installation of the flexplate, clutch, or coupling, is the reverse of removal.



LVAL13852—UN—18NOV10

C—Cap Screws
D—Flywheel

E—Dowel Pin

OUO1023,0002EFB -19-10FEB11-2/2

Camshaft

Removing:

1. Remove the rocker arm assembly and push rods. (See Rocker Arm Assembly in Section 30, Group 30.)
2. Remove the timing gear cover. (See Timing Gear Cover in Section 30, Group 30.)
3. Check the camshaft end play. (See Camshaft End Play Check in Section 30, Group 25.)
4. Check the backlash of the timing gears. (See Timing Gear Backlash Check in Section 30, Group 25.)

NOTE: If a magnetic follower holder kit is not available, turn engine until oil pan is upward, to hold cam followers away from camshaft.

5. Hold the cam followers away from the camshaft using a magnetic follower holder kit such as D15001NU.
6. Rotate the crankshaft and align the timing marks.

IMPORTANT: Avoid Damage! DO NOT allow the camshaft lobes to hit any bearing surfaces while removing the camshaft. Machined surfaces can be damaged.

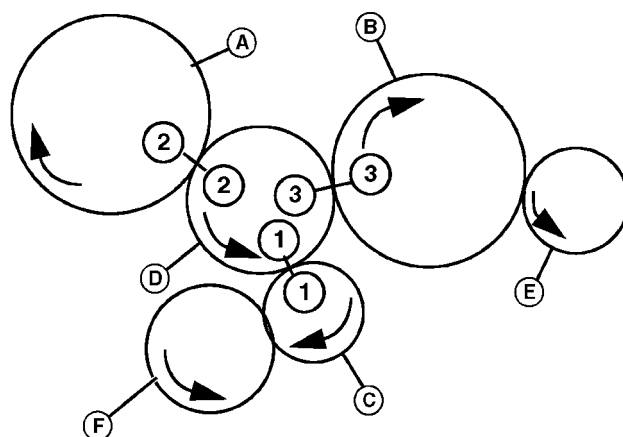
7. Remove two thrust plate mounting cap screws, the thrust plate, and the camshaft.
8. Inspect all parts for wear or damage.

Installing:

IMPORTANT: Avoid Damage! DO NOT allow camshaft lobes to hit bearing surfaces while installing camshaft. Machined surfaces and bearings can be damaged.

NOTE: Apply clean engine oil on all parts during installation.

1. Rotate the crankshaft to align the timing marks (1, 2 and 3).



Viewed From Gear Case

A—Fuel Injection Drive Gear
B—Camshaft Gear
C—Crankshaft Gear
D—Idler Gear
E—Hydraulic Pump Gear

NOTE: The fuel injection drive gear (A), the camshaft gear (B) and the crankshaft gear (C) all must be correctly timed to the idler gear (D). It is not necessary to time the hydraulic pump gear (E) or oil pump gear (F—3TNV8x-BJT, -BMJT, -BXJT engines). Due to the odd number of teeth on the idler gear, timing marks will only align periodically.

2. Install the camshaft.
3. Install the thrust plate and cap screws.
4. Install the timing gear cover. (See Timing Gear Cover in Section 30, Group 30.)
5. Install the push rods and rocker arm assembly.

Continued on next page

OUO1023,0002EFC -19-10FEB11-1/8

Inspection/Replacement:

1. Check the camshaft side gap using a feeler gauge. If the side gap (A) exceeds **0.05—0.25 mm**, remove the camshaft gear (B) and replace thrust plate (C).

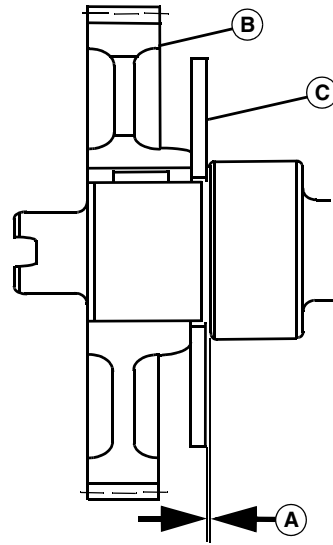
Specification

Camshaft—Side Gap.....0.05—0.25 mm
(0.002—0.010 in.)

2. Remove the gear (if necessary) from camshaft using a knife-edge puller and a press. Inspect the gear for chipped or broken teeth. Replace the gear if necessary.

A—Side Gap
B—Camshaft Gear

C—Thrust Plate



LVAL13854—UN—18NOV10

OUO1023,0002EFC -19-10FEB11-2/8

Gear Removal/Installation:

CAUTION: Avoid Injury! DO NOT heat oil over 182 °C (360 °F). Oil fumes or oil can ignite above 193 °C (380 °F). Use a thermometer. Do not allow a flame or heating element to come in direct contact with the oil. Heat the oil in a well-ventilated area. Plan a safe handling procedure to avoid burns.

1. Heat the gear in oil to approximately 150 °C (300 °F).

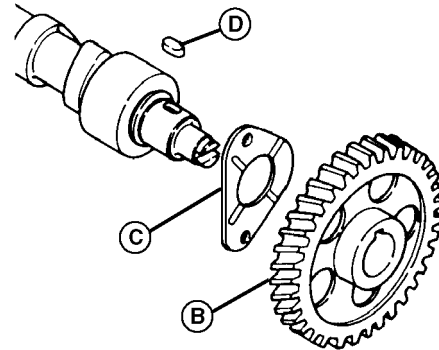
IMPORTANT: Avoid Damage! Be sure that thrust plate is not between camshaft gear and camshaft shoulder while installing gear.

NOTE: Thrust plate must spin freely on camshaft.

2. Install the thrust plate (C) if removed. Install the gear (B) with timing mark "C" side toward press table. Align the slot in the gear with key (D) in shaft. Press the camshaft into gear until gear is tight against camshaft shoulder.

B—Gear
C—Thrust Plate

D—Key



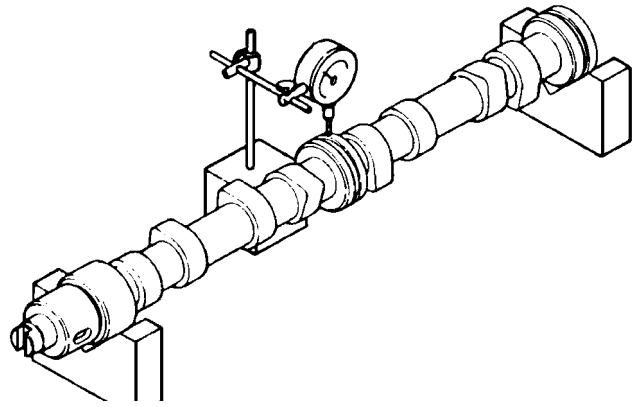
LVAL13855—UN—03DEC10

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OUO1023,0002EFC -19-10FEB11-3/8

3. Inspect the camshaft for bend using V-blocks and a dial indicator. Turn the camshaft slowly and read variations on the indicator.

- If the variation is greater than **0.02 mm (0.001 in.)**, replace the camshaft.



LVAL13856—UN—18NOV10

OUO1023,0002EFC -19-10FEB11-4/8

4. Measure the camshaft lobe height (E).

- Camshaft lobe height is **38.6—38.8 mm (1.52—1.528 in.)**.

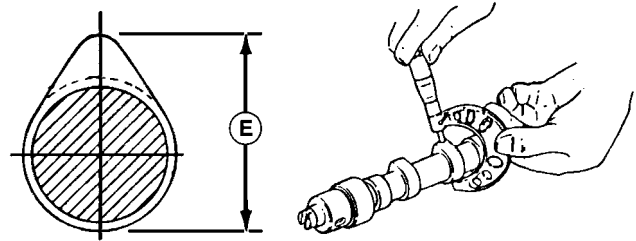
Specification

Camshaft Lobe—Height.....38.6—38.8 mm
(1.52—1.528 in.)

- If the lobe height is less than **38.35 mm (1.51 in.)**, replace the camshaft.

Specification

Camshaft Lobe—Wear
Limit—Height.....38.35 mm
(1.51 in.)



E—Camshaft Lobe Height

LVAL13857—UN—18NOV10

OUO1023,0002EFC -19-10FEB11-5/8

5. Measure the camshaft journal diameters.

- Gear housing (F) and flywheel end camshaft journal (G) outer diameter is **44.93—44.95 mm (1.769—1.770 in.)**.

Specification

Flywheel End Camshaft
Journal—OD.....44.93—44.95 mm
(1.769—1.770 in.)

- Intermediate camshaft journal (H) outer diameter is **44.91—44.94 mm (1.768—1.769 in.)**.

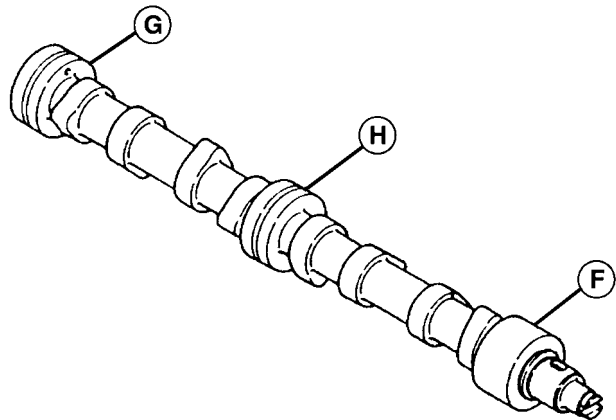
Specification

Intermediate Camshaft
Journal—OD.....44.91—44.94 mm
(1.768—1.769 in.)

- If the journal diameters are less than **44.85 mm (1.766 in.)**, replace the camshaft.

Specification

Camshaft
Journal—Flywheel End
and Intermediate —OD.....44.85 mm
(1.766 in.)



**F—Gear Housing
G—Flywheel End Camshaft
Journal**

**H—Intermediate Camshaft
Journal**

LVAL13858—UN—18NOV10

Continued on next page

OUO1023,0002EFC -19-10FEB11-6/8

6. Measure the camshaft bushing (I) diameter at the gear housing end.

- Standard camshaft bushing inner diameter is **44.99—45.06 mm (1.771—1.774 in.)**.

Specification

Camshaft Bushing—ID.....44.99—45.06 mm
(1.771—1.774 in.)

- Replace the bushing if the diameter exceeds **45.10 mm (1.776 in.)**.

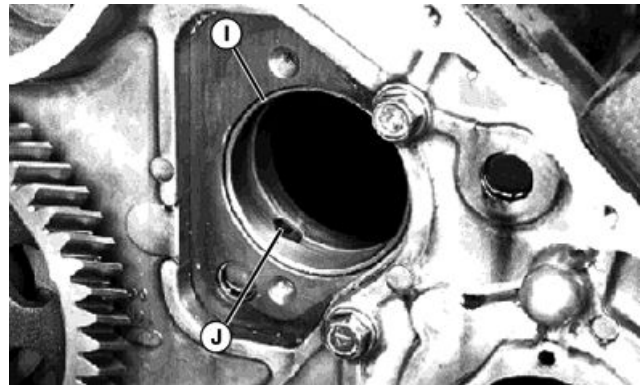
Specification

Camshaft
Bushings—Wear
Limit—ID.....45.10 mm
(1.776 in.)

- If the bushing clearance (bushing inner diameter minus camshaft journal outer diameter) exceeds **0.20 mm (0.008 in.)**, replace the bushing, camshaft or both.

Specification

Camshaft Bushing—Oil
Clearance.....0.20 mm
(0.008 in.)



I— Camshaft Bushing

J— Oil Holes

- Replace the camshaft bushing using a chisel. Be careful not to push the bushing inside the engine.
- Align the oil holes (J) in new bushing and cylinder block. Install bushing using a driver set.

OUO1023,0002EFC -19-10FEB11-7/8

LVAL13859 —UN—18NOV10

9. Measure the intermediate (K) and flywheel end (L) camshaft bore diameters.

- Standard camshaft bore inner diameter is **45.00—45.025 mm (1.772—1.773 in.)**.

Specification

Camshaft
Bore—Intermediate and
Flywheel—ID.....45.00—45.025 mm
(1.772—1.773 in.)

- If the bore diameter exceeds **45.10 mm (1.776 in.)**, replace cylinder block.

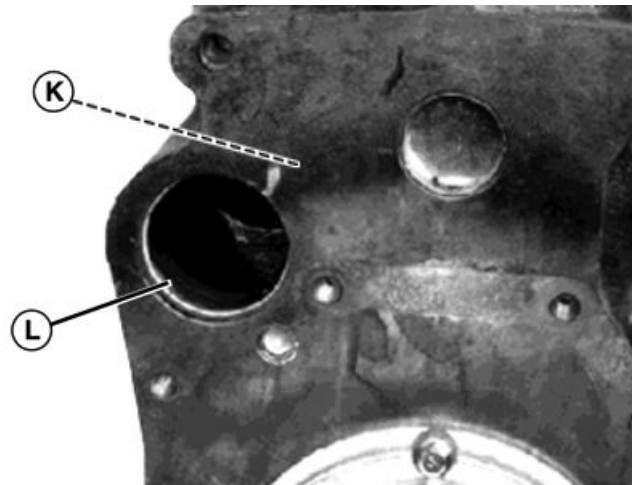
Specification

Camshaft
Bore—Intermediate and
Flywheel—ID.....45.10 mm
(1.776 in.)

- If the bore clearance (bore inner diameter minus camshaft journal outer diameter) exceeds **0.20 mm (0.008 in.)**, replace camshaft, cylinder block or both.

Specification

Camshaft Bore,
Intermediate, and
Flywheel—Oil
Clearance.....0.20 mm
(0.008 in.)



K—Intermediate Camshaft
Bore

L—Flywheel End Camshaft
Bore

- Apply John Deere Form-In-Place Gasket, or an equivalent, on the outer edge of the plug. Install the plug until it bottoms in the bore.

OUO1023,0002EFC -19-10FEB11-8/8

LVAL13860 —UN—18NOV10

Camshaft Followers

Removing/Installing:

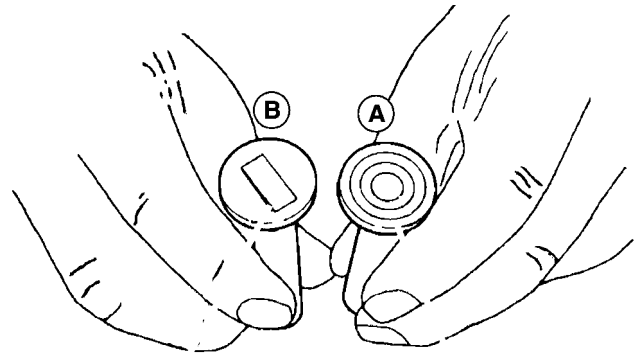
1. Remove the camshaft. (See Camshaft in Section 30, Group 30.)
2. Remove the oil pan and strainer.

IMPORTANT: Avoid Damage! Cam followers must be installed in the same bores from which they were removed.

3. Put a mark on each cam follower and the cylinder block bore to aid in installation.
4. Remove the cam followers.
5. Inspect all parts for wear or damage.
6. Apply clean engine oil to all parts during installation.
7. Install parts in reverse order.

Inspection:

1. Inspect the cam follower contact surface for normal contact (A) or abnormal wear (B). Replace if necessary.



A—Normal Contact

B—Abnormal Wear

LVAL13861—UN—18NOV10

OUO1023,0002EFD -19-10FEB11-1/2

2. Measure the cam follower stem diameter.

- Standard cam follower stem outer diameter is **11.98—11.99 mm (0.471—0.472 in.)**.

Specification

Cam Follower	
Stem—OD.....	11.98—11.99 mm (0.471—0.472 in.)

- If the stem diameter is less than **11.93 mm (0.470 in.)**, replace cam follower.

Specification

Cam Follower	
Stem—Wear Limit—OD.....	11.93 mm (0.470 in.)

3. Measure the cam follower bore diameter in the cylinder block.

- Standard cam follower bore inner diameter is **12.00—12.02 mm (0.472—0.473 in.)**.

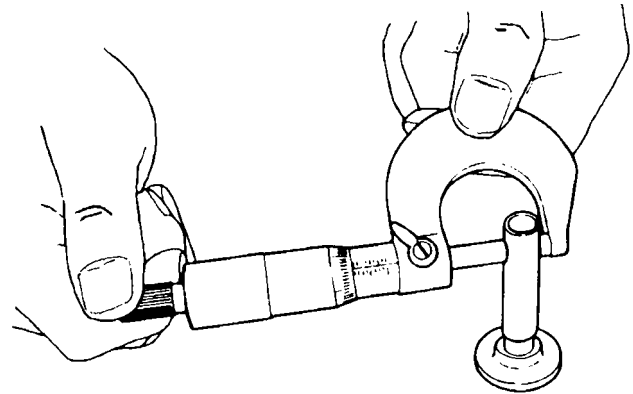
Specification

Cam Follower Bore—ID.....	12.00—12.02 mm (0.472—0.473 in.)
---------------------------	-------------------------------------

- If the cam follower bore diameter exceeds **12.05 mm (0.474 in.)**, replace the cylinder block.

Specification

Cam Follower	
Bore—Wear Limit—ID.....	12.05 mm (0.474 in.)



LVAL13862—UN—18NOV10

- Standard cam follower bore clearance is **0.01—0.04 mm (0.0004—0.002 in.)**.

Specification

Cam Follower	
Bore—Clearance.....	0.01—0.04 mm (0.0004—0.002 in.)

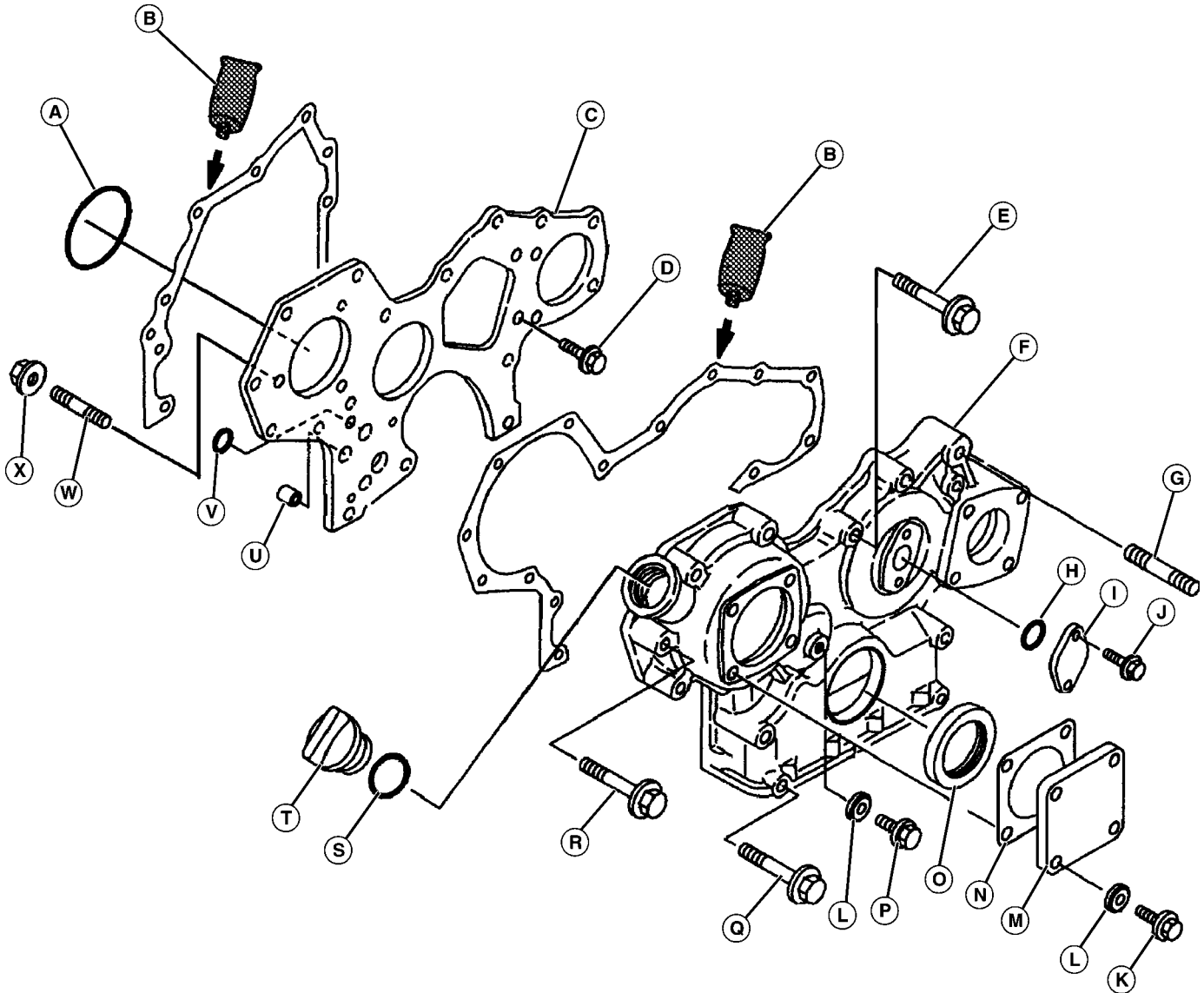
- If the bore clearance (bore inner diameter minus follower stem outer diameter) exceeds **0.12 mm (0.005 in.)**, replace the cam follower, cylinder block or both.

Specification

Cam Follower	
Bore—Wear	
Limit—Clearance.....	0.12 mm (0.005 in.)

OUO1023,0002EFD -19-10FEB11-2/2

Timing Gear Cover



A—O-ring
 B—Form-In-Place Gasket
 C—Mounting Plate
 D—Bolt, M8 x 16
 E—Cap Screw, M8 x 55
 F—Timing Gear Cover

G—Stud, M10
 H—O-ring
 I—Cover
 J—Cap Screw
 K—Cap Screw, M8 x 12
 L—Seal Washer, M8
 M—Cover

N—Gasket
 O—Oil Seal
 P—Cap Screw, M8 x 16
 Q—Cap Screw, M8 x 85
 R—Cap Screw, M8 x 45
 S—O-ring

T—Oil Fill Cap
 U—Dowel
 V—O-ring
 W—Stud, M8 x 22
 X—Nut

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OUO1023,0002EFE -19-10FEB11-1/3

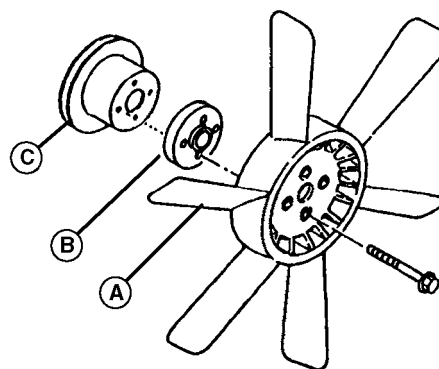
LVAL13863—UN—18NOV10

Removal/Installation:

1. Remove the alternator and belt.
2. Remove the fan (A), spacer (B) and pulley (C).
3. Remove the crankshaft pulley cap screw and washer.
4. Remove the crankshaft pulley using a two-jaw puller.

NOTE: It is not necessary to remove end cover and O-ring or fuel injection pump gear cover to remove timing gear cover.

5. Remove the mounting cap screws and timing gear cover.
6. Inspect the crankshaft oil seal for wear or damage. Replace if necessary. Replace the oil seal using a driver set. Install the seal with lip toward inside of gear housing cover. Install the seal flush with surface of cover.



A—Fan
B—Spacer

C—Pulley

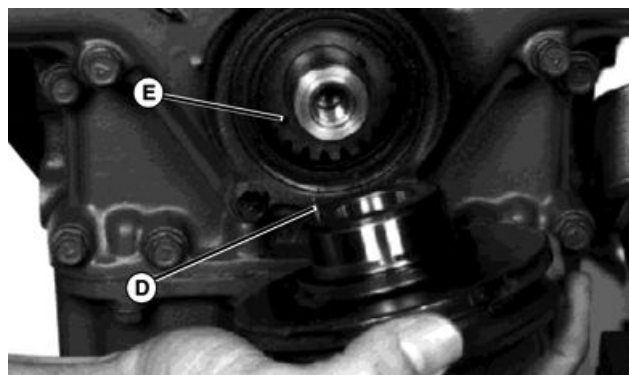
OUO1023,0002EFE -19-10FEB11-2/3

LVAL13864 —UN—30NOV10

7. Installation is done in the reverse order of removal.
 - a. Replace the seal washer.
 - b. Align the pin (D) in crankshaft pulley with the hole (E) in the crankshaft gear. Install the crankshaft pulley.
 - c. Adjust the fan/alternator drive belt tension.

D—Pin

E—Hole



OUO1023,0002EFE -19-10FEB11-3/3

LVAL13865 —UN—18NOV10

Idler Gear

Removing/Installing:

1. Remove the timing gear cover. (See Timing Gear Cover in Section 30, Group 30.)
2. Check the backlash of timing gears. (See Timing Gear Backlash Check in Section 30, Group 25.)

NOTE: Due to the odd number of teeth on the idler gear, timing marks will only align periodically. When all timing marks on gears align, the piston closest to the water pump is at TDC on compression stroke. Number one cylinder is closest to the flywheel.

3. Rotate the crankshaft and align the timing marks.
4. Remove two cap screws (A), shaft (B) and 43T gear (C).
5. Inspect all parts for wear or damage.

Installation is done in the reverse order of removal.

Inspection:

1. Inspect the gear for chipped or broken teeth. Replace if necessary.
 - Measure the idler gear shaft diameter.
 - Standard idler gear shaft outer diameter is **45.95—45.98 mm (1.809—1.810 in.)**.

Specification

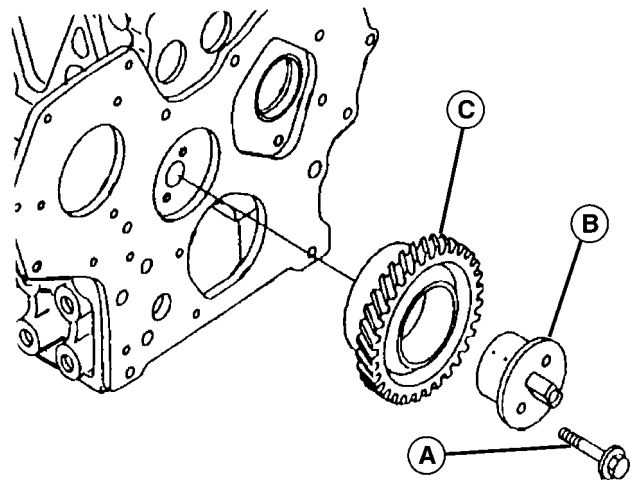
Idler Gear Shaft—OD.....45.95—45.98 mm
(1.809—1.810 in.)

- If the shaft diameter is less than **45.93 mm (1.808 in.)**, replace idler gear shaft.

Specification

Idler Gear Shaft—Wear
Limit—OD.....45.93 mm
(1.808 in.)

2. Measure the idler gear bushing diameter.
 - Standard idler gear bushing inner diameter is **46.00—46.03 mm (1.811—1.812 in.)**.



A—Cap Screw (2 used)
B—Shaft

C—43T Gear

Specification

Idler Gear Bushing—ID.....46.00—46.03 mm
(1.811—1.812 in.)

- Replace the bushing if diameter exceeds **46.03 mm (1.812 in.)**.

Specification

Idler Gear Bushing—Wear
Limit—ID.....46.03 mm
(1.812 in.)

- If the bore clearance (bushing inner diameter minus shaft outer diameter) exceeds **0.15 mm (0.006 in.)**, replace the bushing, shaft, or both.

Specification

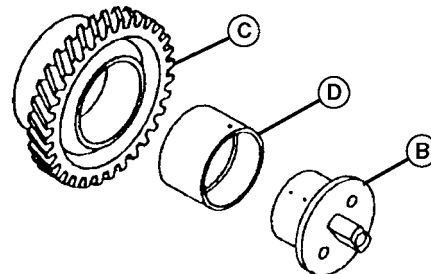
Idler Gear Bushing—Clearance.....0.15 mm
(0.006 in.)

To Replace The Bushing:

1. Replace the bushing using a driver set.
2. Align the oil holes in bushing (D) and idler gear (C).
3. Install the bushing flush with surface of idler gear.

B—Shaft
C—Idler Gear

D—Bushing



OUO1023,0002EFF -19-10FEB11-2/2

LVAL13867—UN—30NOV10

Timing Gear Cover Mounting Plate

Removing/Installing:

1. Remove the camshaft. (See Camshaft in Section 30, Group 30.)
2. Remove the idler gear. (See Idler Gear in Section 30, Group 30.)
3. Remove the fuel injection pump.
4. Remove the oil pump. (See Oil Pump (Engines 3TNV8x-JT, -MJT) or Oil Pump (Engines 3TNV8x-BJT, -BMJT, -BXJT) in Section 30, Group 30.)
5. Remove the mounting cap screws and plate.
6. Replace the O-rings.
7. Installation is the reverse of removal.

OUO1023,0002F00 -19-10FEB11-1/1

Oil Pan and Crankcase Housing Extension

Removal/Installation

1. Remove engine from machine. (See Engine Removal and Installation.)
2. Remove flywheel from engine. (See Flywheel and Coupling.)
3. Remove the oil pan.
4. Remove the oil pick up strainer.
5. Remove flywheel housing-to-crankcase housing extension cap screws.
6. Remove rear oil seal case-to-crankcase housing extension cap screws.
7. Remove crankcase housing extension from engine block.
8. Clean and inspect all parts. Replace as necessary.
9. Remove sealant residue from oil pan, housing extension and engine block mating surfaces.

Installation

Installation is done in the reverse order of removal.

- Apply RTV adhesive to extension housing-to-engine block mating surface.
- Apply RTV adhesive to oil pan mounting flange.
- Fill the engine with correct engine oil.

AP43109,000304C -19-17APR12-1/1

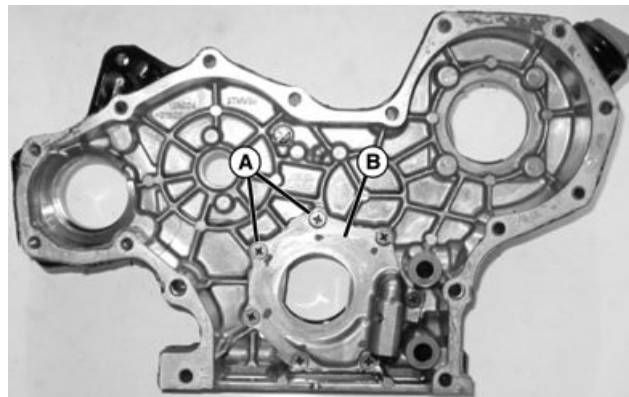
Oil Pump (Engines 3TNV8x-JT, -MJT)

Removal/Installation

1. Remove timing gear cover. (See Timing Gear Cover in Section 30, Group 30.)
2. Remove the seven screws (A) from oil pump cover (B) and remove cover.

A—Screw (7 used)

B—Oil Pump Cover



LVAL13868—UN—18NOV10

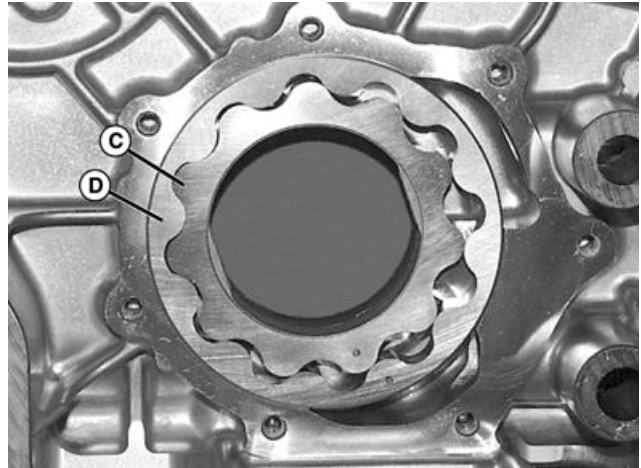
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OUO1023,0002F02 -19-10FEB11-1/9

3. Remove inner rotor (C) and outer rotor (D) and check for wear or damage. Check inside of cover for wear or deep scratches. Replace any worn or damaged parts.

C—Inner Rotor

D—Outer Rotor



LVAL13869 —UN—18NOV10

OOU1023,0002F02 -19-10FEB11-2/9

4. Inspect inside of oil pump cover for grooves or deep scratches. Replace cover if worn or damaged.



LVAL13870 —UN—18NOV10

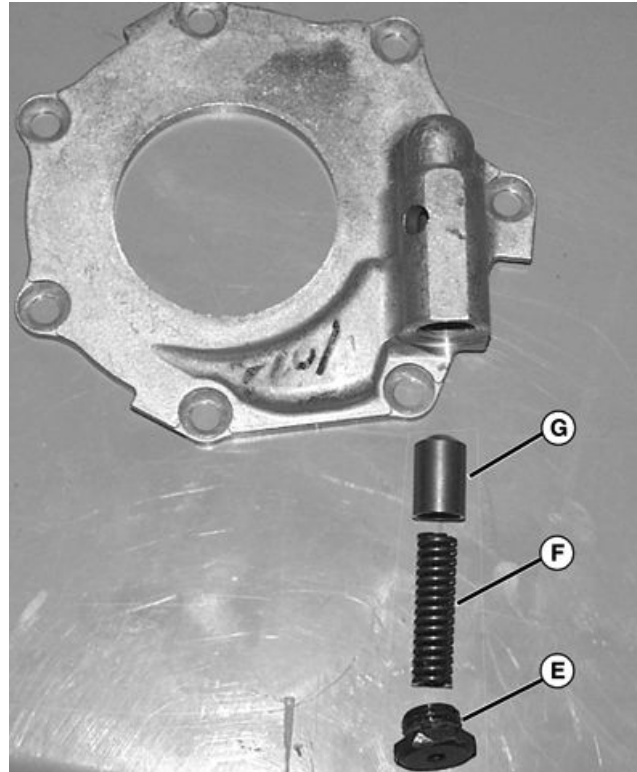
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OOU1023,0002F02 -19-10FEB11-3/9

5. Remove relief valve cap (E), spring (F), and valve (G). Inspect all parts for wear or damage. Replace any worn or damaged parts

E—Relief Valve Cap
F—Spring

G—Valve



LVAL13871—UN—18NOV10

OOU1023,0002F02 -19-10FEB11-4/9

6. Measure across the flats on the crankshaft gear (H). Measurement should be **49.45—49.75 mm (1.946—1.958 in.)**.

Specification

Crankshaft
Gear—Distance.....49.45—49.75 mm
(1.946—1.958 in.)

7. Measure across inside of flats on the inner rotor (I). Measurement should be **49.95—50.05 mm (1.966—1.970 in.)**.

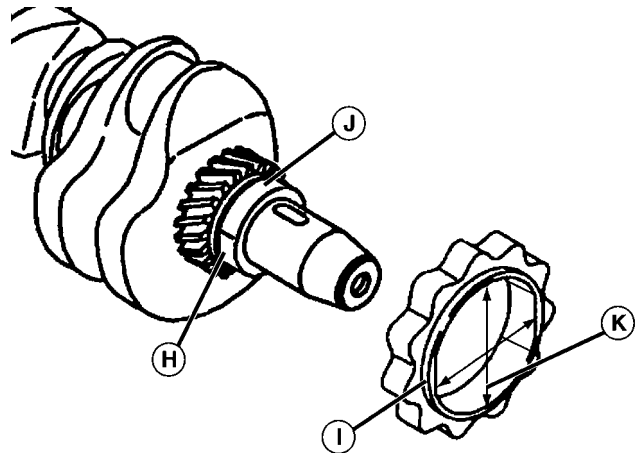
Specification

Inner Rotor—Distance.....49.95—50.05 mm
(1.966—1.970 in.)

8. Measure outer diameter of crankshaft gear boss (J). Measurement should be **53.05—53.15 mm (2.088—2.092 in.)**. Measure inner diameter of inner rotor (K). Measurement should be **53.45—53.55 mm (2.104—2.108 in.)**.

Specification

Crankshaft Gear
Boss—OD.....53.05—53.15 mm
(2.088—2.092 in.)



H—Crankshaft Gear
I—Inner Rotor

J—Crankshaft Gear Boss
K—Inner Rotor

Inner Rotor—ID.....53.45—53.55 mm
(2.104—2.108 in.)

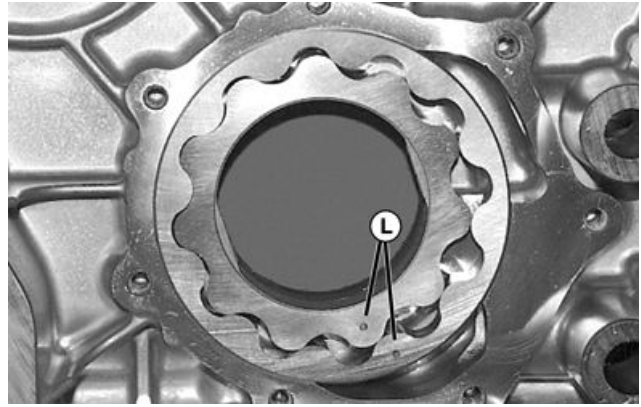
LVAL13872—UN—18NOV10

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OOU1023,0002F02 -19-10FEB11-5/9

9. When installing inner and outer rotors, make sure marks (L) are near each other and facing outward.

L—Marks



LVAL13873—UN—18NOV10

OUC1023,0002F02 -19-10FEB11-6/9

10. Measure clearance between outer rotor (M) and timing cover (N) with a feeler gauge (O). Standard clearance is **0.12—0.21 mm (0.0047—0.008 in.)**. Wear limit is **0.30 mm (0.012 in.)**. If clearance exceeds wear limit, replace timing cover and both rotors.

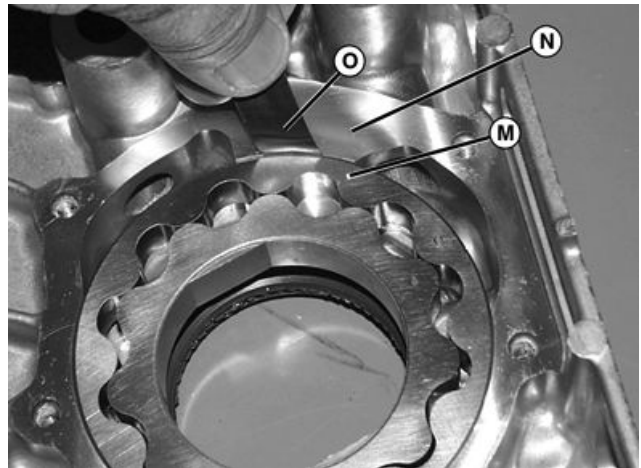
Specification

Timing Cover-to-Outer
Rotor—Clearance.....0.12—0.21 mm
(0.0047—0.008 in.)

Timing Cover-to-Outer
Rotor—Wear
limit—Clearance.....0.30 mm
(0.012 in.)

M—Outer Rotor
N—Timing Cover

O—Feeler Gauge



LVAL13874—UN—18NOV10

OUC1023,0002F02 -19-10FEB11-7/9

11. Measure between high spots of inner and outer rotors with a feeler gage. If clearance exceeds **0.16 mm (0.006 in.)** replace rotors.

Specification

Inner Rotor-to-Outer
Rotor—Clearance.....0.16 mm
(0.006 in.)



LVAL13875—UN—18NOV10

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OUC1023,0002F02 -19-10FEB11-8/9

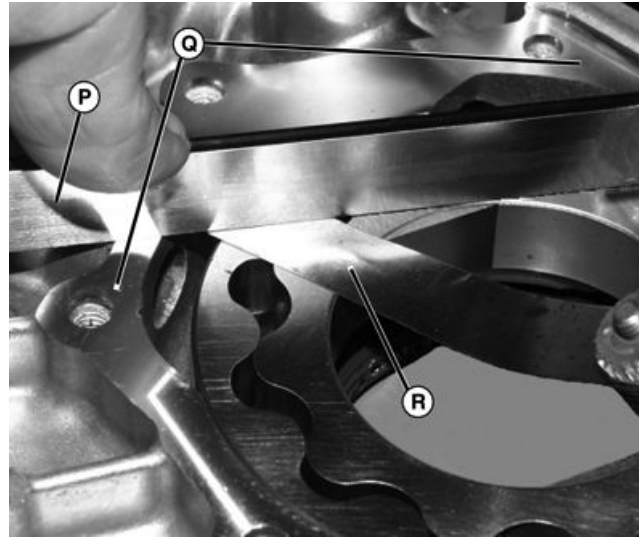
12. Place a straight edge (P) across timing gear cover bosses (Q) and measure gap between edge of timing gear cover and the rotors with a feeler gauge (R). Standard gap is **0.02—0.07 mm (0.0008—0.0027 in.)**. Wear limit is . If clearance exceeds wear limit replace timing gear cover and rotors.

Specification

Edge of Timing Gear	
Cover-to-Rotors—Gap.....	0.02—0.07 mm (0.0008—0.0027 in.)
Edge of Timing Gear	
Cover-to-Rotors—Wear	
Limit—Gap.....	0.12 mm (0.0047 in.)

13. Assemble in the reverse order of disassembly.
14. Apply medium strength thread locking compound to oil pump cover screws when installing.

P—Straight Edge R—Feeler Gauge
Q—Timing Gear Cover Bosses



LVAL13876—UN—18NOV10

OUO1023,0002F02 -19-10FEB11-9/9

Oil Pump (Engines 3TNV8x-BJT, -BMJT, -BXJT)

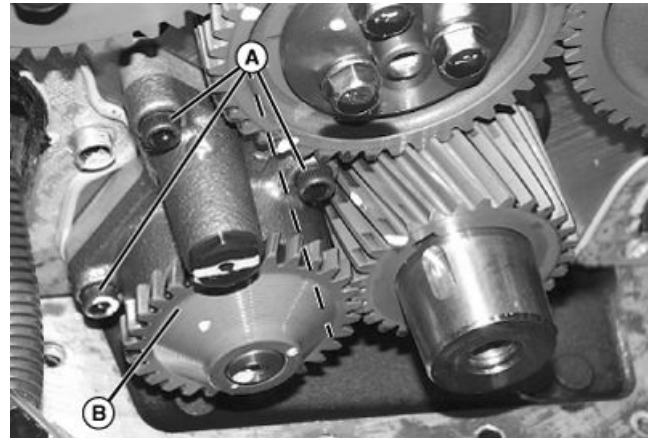
Removing/Installing:

1. Remove timing gear cover. (See Timing Gear Cover in Section 30, Group 30.)
2. Check the oil pump gear backlash. Replace the oil pump assembly if backlash is more than **0.12 mm (0.005 in.)**.

Specification

Oil Pump	
Gear—Backlash.....	0.12 mm (0.005 in.)

3. Remove the four mounting screws (A) and the oil pump (B).



A—Mounting Screw (4 used) B—Oil Pump

LVAL13877—UN—30NOV10

Continued on next page

OUO1023,0002F03 -19-10FEB11-1/8

- Remove gasket (C) from engine block.

Installation:

- Make sure that all old gasket material has been removed from engine block and oil pump.
- Install new gasket on oil pump.
- Install oil pump on engine block with four socket head bolts.
- Tighten bolts to specification.

Specification

Socket Head Bolt-to-Oil	
Pump—Torque.....	25 N·m (18 lb.-ft.)

C—Gasket

LVAL13878—UN—30NOV10

OUO1023,0002F03 -19-10FEB11-2/8

Oil Pump Disassembly/Assembly:

NOTE: There are no serviceable parts inside the oil pump. If anything is worn beyond specification replace entire oil pump.

- Carefully remove plate (D) from back of oil pump.

D—Plate

LVAL13879—UN—30NOV10

OUO1023,0002F03 -19-10FEB11-3/8

- Lay a straightedge across the pump body and check the rotor recess (E) with a feeler gauge.

- Standard rotor recess is **0.03—0.09 mm (0.001—0.004 in.)**.

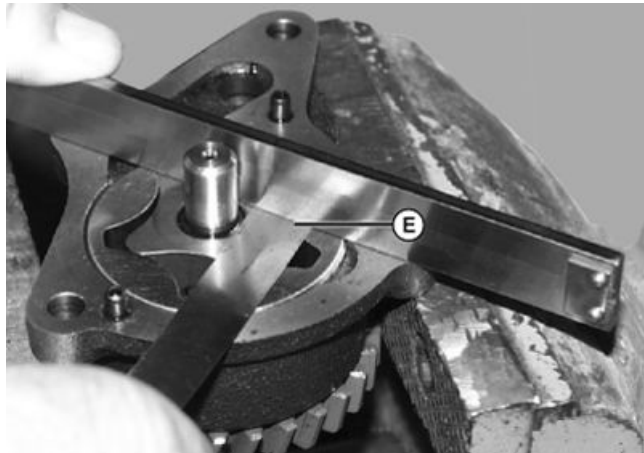
Specification

Oil Pump	
Rotor—Recess.....	0.03—0.09 mm (0.001—0.004 in.)

- Replace the pump if the recess exceeds **0.15 mm (0.006 in.)**.

Specification

Oil Pump Rotor—Wear	
Limit—Recess.....	0.15 mm (0.006 in.)

E—Rotor Recess

LVAL13880—UN—30NOV10

Continued on next page

OUO1023,0002F03 -19-10FEB11-4/8

3. Measure outer rotor-to-pump body clearance (F) with a feeler gauge.

- Standard clearance is **0.10—0.16 mm (0.004—0.006 in.)**.

Specification

Outer Rotor-to-Oil Pump

Body—Clearance.....0.10—0.16 mm
(0.004—0.006 in.)

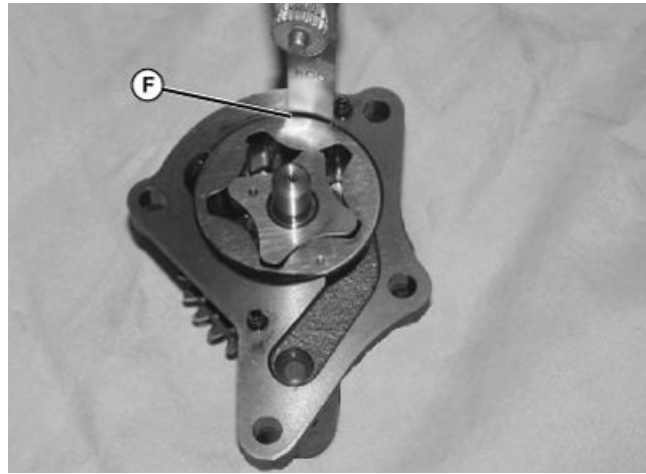
- Replace the pump if the clearance is more than **0.25 mm (0.010 in.)**.

Specification

Outer Rotor-to-Oil

Pump Body—Wear

Limit—Clearance..... 0.25 mm
(0.010 in.)



F—Clearance

OOU1023,0002F03 -19-10FEB11-5/8

LVAL13881—UN—30NOV10

4. Check inner-to-outer rotor clearance (G) with feeler gauge.

- Replace the pump if clearance is more than **0.15 mm (0.006 in.)**.

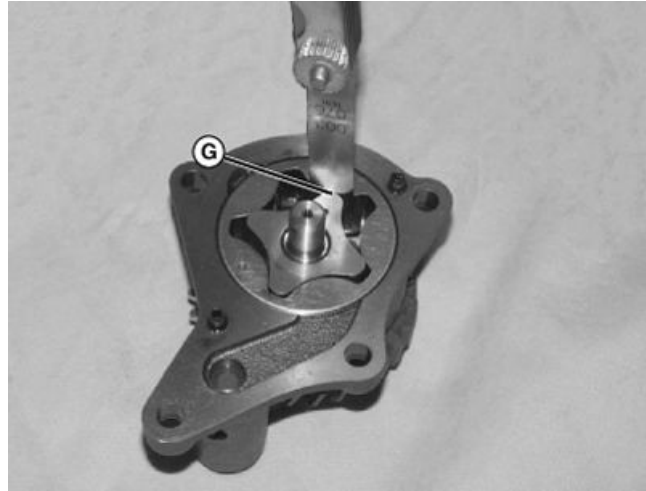
Specification

Oil Pump—Inner-to-

Outer Rotor—Clearance..... 0.15 mm
(0.006 in.)

5. Check the oil pressure relief valve. If the relief valve piston (H) is sticking in the pump body, clean parts to allow free movement of the piston in pump body.

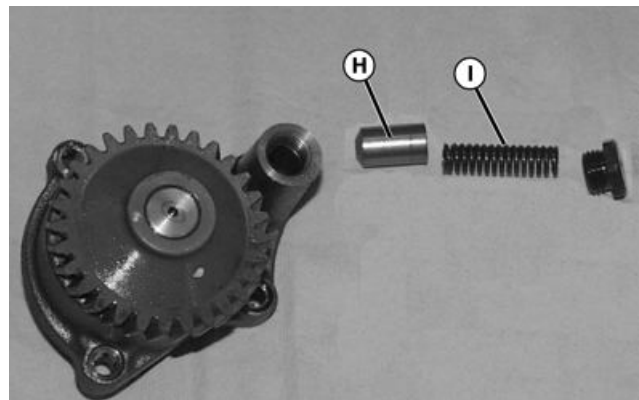
6. Inspect the spring (I) for cracks. The spring is not serviceable. If damage is identified, replace the oil pump assembly.



G—Clearance

I—Spring

H—Relief Valve Piston



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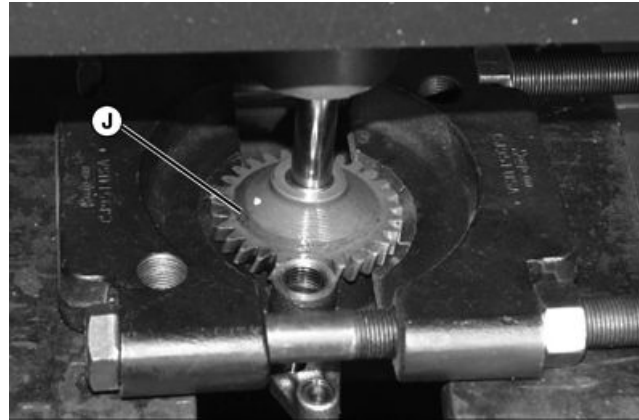
OOU1023,0002F03 -19-10FEB11-6/8

LVAL13882—UN—30NOV10

LVAL13883—UN—18NOV10

7. Press drive gear (J) from pump shaft as shown.

J— Drive Gear



LVAL13884—UN—18NOV10

OUO1023,0002F03 -19-10FEB11-7/8

8. Measure the outer diameter of rotor shaft (L) and the inner diameter of shaft hole (K) in cover.

- Standard clearance is **0.01—0.04 mm (0.001—0.002 in.)**.

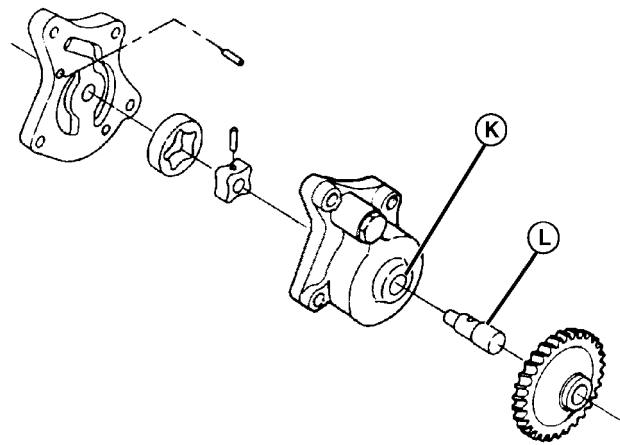
Specification

Outer Diameter of
Rotor Shaft-to-Inner
Diameter of Shaft
Hole—Clearance.....0.01—0.04 mm
(0.001—0.002 in.)

- Replace the pump if the clearance is greater than **0.2 mm (0.008 in.)**.

Specification

Outer Diameter of Rotor
Shaft-to-Inner Diameter
of Shaft Hole—Wear
Limit—Clearance.....0.2 mm
(0.008 in.)



K—Shaft Hole

L—Rotor Shaft

LVAL13885—UN—30NOV10

OUO1023,0002F03 -19-10FEB11-8/8

Section 40 Electrical—NA

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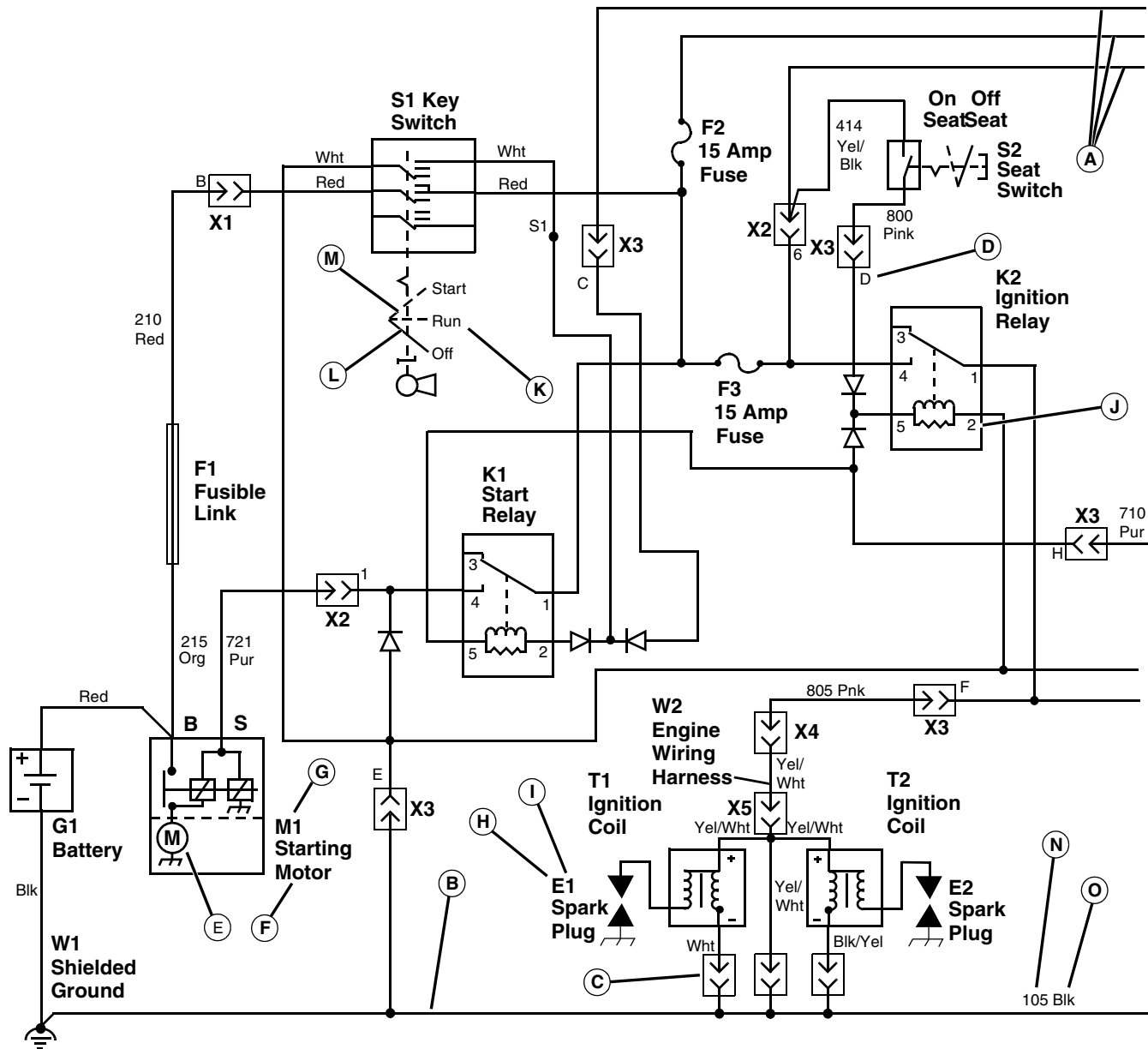
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Alternator Disassembly and Assembly	40-65-18
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Reading Electrical Schematics



A—Power Wire
B—Ground Wire
C—Connector
D—Terminal Pin Location
E—Symbol
F—Name

G—Identification Code
H—Identifying Letter
I—Identifying Number
J—Terminal Designation

K—Switch Position
L—Solid Line (current switch position)
M—Dash Line (other possible switch positions)

N—Circuit Number
O—Wire Color

The schematic is made up of individual circuits laid out in a sequence of related functions. It is formatted with all power wires (A) across the top and all ground wires (B) across the bottom. Current flow is generally from top to bottom through each circuit and component. All components are shown in the off position. The diagram does not list connector (C) information unless needed to

avoid confusion. If the connector is shown, the number next to it is the terminal pin location (D) in the connector.

Each component is shown by a symbol (E), its name (F), and an identification code (G). The identification code contains a device identifying letter (H) and number (I).

Continued on next page

KN52281,100425C -19-04OCT12-1/2

The identifying letter is always the same for a specific component, but the identifying numbers are numbered consecutively from upper left to lower right. The terminal designation (J) is placed directly inside or outside the symbol next to the connecting wire path. Switch positions (K) are also placed directly inside or outside the symbol. The solid line (L) shows the position the switch is currently in and dash lines (M) represent other switch positions.

The circuit number (N) and wire color (O) of the wires are shown directly next to the wire path.

The same component name and identification code are used consistently on all diagrams in this section. Components can be easily cross-referenced.

KN52281,100425C -19-04OCT12-2/2

Theory Of Operation Information

The theory of operation stories divide the electrical system into individual circuits by function. Each circuit is isolated from the main wiring schematic and only shows the components that are used in it. The story contains

information on function, operating conditions, and theory of operation. The circuit schematics are drawn with the components in the operating position, with the power, or battery positive, into them across the top and the ground, or battery negative, across the bottom.

KN52281,100425D -19-04OCT12-1/1

Diagnostic Information

The diagnostic procedures is used to test the complete circuit regardless of the problem or complaint. Select a symptom or system from the quick check or troubleshooting chart and follow the test procedures under that heading.

The diagnostic procedure lists:

- Test conditions
- Test sequence
- Test location
- Normal reading

- Check or test to perform if reading is not normal

When performing the test or check, be sure to set your machine up to the TEST POINT/PROCEDURES listed in the first column and follow the sequence carefully. The middle RESULTS column gives the reading or condition that should be obtained in **BOLD** print. If the results of the test or check are not normal, perform the test, check, or adjustment listed below the **BOLD** print. The system diagram that accompanies each test procedure is drawn to resemble machine components. The leader line points to the exact point the test is to be made.

KN52281,100425E -19-04OCT12-1/1

Wire Color Abbreviation Chart

Blk	Black
Blu	Blue
Brn	Brown
Grn	Green
Gry	Gray
Org	Orange
Pnk	Pink
Pur	Purple
Red	Red
Tan	Tan
Wht	White
Yel	Yellow
Blk/Wht	Black/White
Blu/Wht	Blue/White
Brn/Wht	Brown/White
Brn/Yel	Brown/Yellow
Dk Blu	Dark Blue
Dk Brn/Lt Grn	Dark Brown/Light Green
Dk Brn/Red	Dark Brown/Red
Dk Brn/Yel	Dark Brown/Yellow
Dk Grn	Dark Green
Lt Blue	Light Blue
Lt Grn	Light Green
Org/Wht	Orange/White
Pnk/Blk	Pink/Black
Pur/Wht	Purple/White
Red/Blk	Red/Black
Red/Wht	Red/White
Wht/Blk	White/Black
Wht/Red	White/Red
Yel/Blk	Yellow/Black
Yel/Red	Yellow/Red
Yel/Wht	Yellow/White

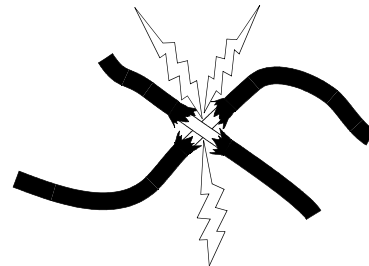
KN52281,100425F -19-04OCT12-1/1

Common Circuit Tests

Shorted Circuit:

A shorted circuit may result in the wrong component operating (i.e. improper wire-to-wire contact). To test for a shorted or improperly wired circuit:

1. Turn component switch ON.
2. Start at the controlling switch of the component that should not be operating.
3. Follow the circuit and disconnect wires at connectors until component stops operating.
4. Shorted or improper connections will be the last two wires disconnected.



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Continued on next page

KN52281,1004260 -19-04OCT12-1/3

High Resistance or Open Circuit:

High resistance or open circuits usually result in slow, dim or no component operation (i.e. poor, corroded, or disconnected connections). Voltage at the component will be low when the component is in operation. To test for high resistance and open circuits:

- 1. Check all terminals and grounds of the circuit for corrosion.
- 2. If terminals are not corroded or loose, the problem
- 3. is in the component or wiring.

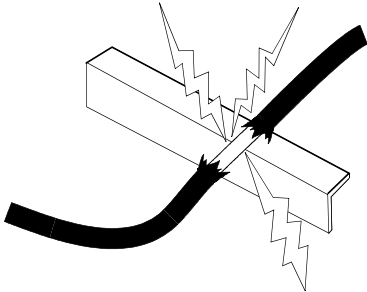


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Grounded Circuit:

Grounded circuits usually result in no component operation or a blown fuse.



LVAL11533 —UN—02NOV10

KN52281,1004260 -19-04OCT12-3/3

Conductors For 12 Volt Circuits

STRANDED CONDUCTORS FOR 12 VOLT CIRCUITS						
SAE Wire Size (Gauge)	20	18	16	14	12	10
Metric Wire Size (MM)	0.5	0.8	1.0	2.0	3.0	5.0
Typical Stranding	7 X 28	16 X 30	19 X 29	19 X 27	19 X 25	19 X 23
Minimum Conductor Area In Circular Mils	1072	1537	2336	3702	5833	9343

KN52281,1004261 -19-04OCT12-1/1

System Specifications

Item	Measurement	Specification
Battery:		
Battery	Voltage	12VDC
BCI Group	Size	34
CCA Rating	Amps @ -18° C (0° F)	500 amps
Reserve Capacity	Minutes	120
Load Test (minimum)	Amps for 15 seconds	325 amps
Item	Measurement	Specification
Starting Motor:		
Starting Motor	Type	Solenoid Shift
3120 eHydroeHydro™	Size	1.2 kW (1.61 hp)
All Other Models	Size	1.4 kW (1.88 hp)
Max. Amp Draw (on machine)	Draw	300 amps
Max. No-Load Amp Draw (free running)	Draw	325 amps @ 4440 rpm
Max. Starting Solenoid Pull-in Amp Draw	Amperage	55.5 amps
Max. Starting Solenoid Hold-in Amp Draw	Amperage	10.5 amps
Item	Measurement	Specification
Alternator:		
Regulated Voltage	Voltage @ 25°C (77°F)	14.2—14.8 VDC
Unregulated Voltage	Voltage	50 VAC
Amperage	Amps	40 amps
Fuel Shutoff Solenoid:		
Voltage Range	Voltage	6—16 VDC, 12 VDC Nominal
Starting Current (maximum)	Amperage	35 amps
Operating Current	Amperage	0.3 amps
Item	Measurement	Specification
Sensors:		
Engine Coolant Temperature Resistance (variable)	Resistance	22—520 ohms
Fuel Gauge Resistance (variable)	Resistance	8—89 ohms
Engine Oil Pressure Switch Closes (light ON to OFF)	Pressure	40—75 kPa (5.8—10.8 psi)
Item	Measurement	Specification
Lighting:		
Headlights (halogen)	Size	37.5 Watts
Tail/Turn Light	Type	1157
Hazard Lights	Type	1156

Continued on next page

KN52281,1004262 -19-04OCT12-1/2

Specifications

Item	Measurement	Specification
Work Lights (halogen)	Type	886
Item	Measurement	Specification
Torque Specifications:		
Alternator Positive Cable Nut	Torque	13.5 N·m (120 lb-in.)
Position Sensor Lock Nut	Torque	5 N·m (44.25 lb-in.)
Starting Solenoid Positive Cable Nut	Torque	13.5 N·m (120 lb-in.)
Fuel Gauge Sensor Retaining Nut	Torque	25—30 N·m (18.4—22.1 lb-ft)
Fuel Gauge Sensor Terminal Nut	Torque	3.4 N·m (30.0 lb-in.)
Load Center Mounting Nut	Torque	7.5 N·m (66.3 lb-in.)
HST Drive Controller Connector Cap Screw	Torque	2.0 N·m (17.7 lb-in.)
Neutral Start Switch	Torque	27 N·m (19.9 lb-ft)
MFWD Engagement Sensing Switch	Torque	27 N·m (19.9 lb-ft)
Mid PTO Switch	Torque	27 N·m (19.9 lb-ft)

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Essential or Recommended Tools

NOTE: Order tools from the *SERVICEGARD™* Catalog.

ESSENTIAL TOOLS listed are required to perform the job correctly and are obtainable only from the *SERVICEGARD™* Catalog.

SERVICEGARD is a trademark of Deere & Company

RECOMMENDED TOOLS, as noted, are suggested to perform the job correctly. Some tools may be available from local suppliers or may be fabricated.

KN52281,1004263 -19-04OCT12-1/2

Electronic Control Analyzer	JDG1575	Used to check specific gravity of electrolyte in battery cells.
Test and adjust position sensors.		Battery Tester (or Voltmeter).....
Weatherpack extraction Tool	JDG364	Used to measure battery voltage.
To remove contacts from weatherpack connectors.		Current Gun.....
Electrical Circuit Analyzer	JT07324A	Used to measure alternator output current.
To diagnose key switch and associated electrical circuits.		Hand-Held Digital Tachometer.....
Current Clamp-on Probe	JT02153	Used to measure speed of starting motor.
To diagnose current amperage with in electrical wires.		6 foot TCU Cable.....
Analog/Digital Multimeter.....	JT05791	Used to interface the TCU (HST controller) with Service ADVISOR™
To diagnose electrical system circuits and components.		9 inch ICC Cable
Probe Light	JDG186	Used to interface the ICC (Instrument Control Cluster) with Service ADVISOR™
To test for current continuity and grounds.		
Hydrometer.....	NA	

KN52281,1004263 -19-04OCT12-2/2

Other Materials

Number	Name	Use
TY9374/TY9375 (U.S.)	Pipe sealant with TEFLON®	Seal threads on temperature sensor and oil pressure switches.
NA (U.S.)	Bearing Puller Set	Used to remove pulley from alternator.
NA (U.S.)	400-grit Silicon Carbide Sandpaper	Used to polish slip rings.

TEFLON is a trademark of Du Pont Co.

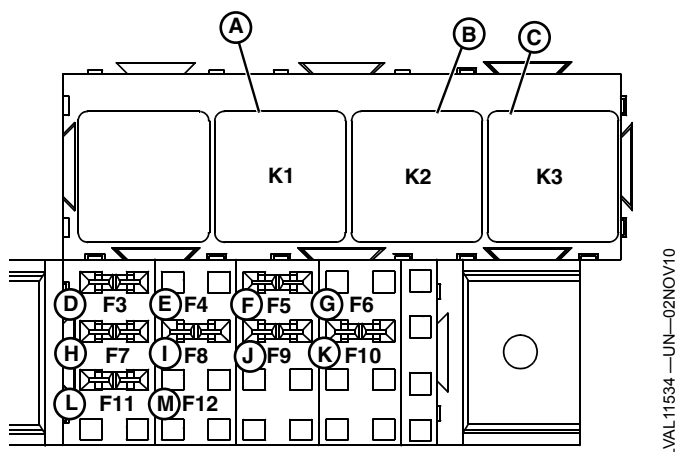
KN52281,1004264 -19-04OCT12-1/1

Group 15 Component Location

Load Center

A—K1—Fuel Relay
B—K2—Start Relay
C—K3—Manifold Heater Relay
D—F3—Fuse 30A
E—F4—Blank
F—F5—Fuse 30A
G—F6—Blank

H—F7—Fuse 20A
I—F8—Fuse 20A
J—F9—Fuse 20A
K—F10—Blank
L—F11—Fuse 10A
M—F12—Blank

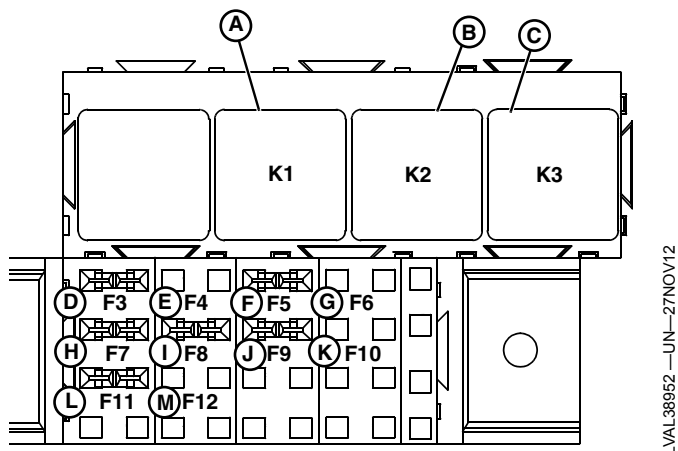


KN52281,1004265 -19-02JAN13-1/1

Load Center—MY13

A—K1—Fuel Relay
B—K2—Start Relay
C—K3—Manifold Heater Relay
D—F3—Fuse 30A
E—F4—Blank
F—F5—Fuse 30A
G—F6—Blank

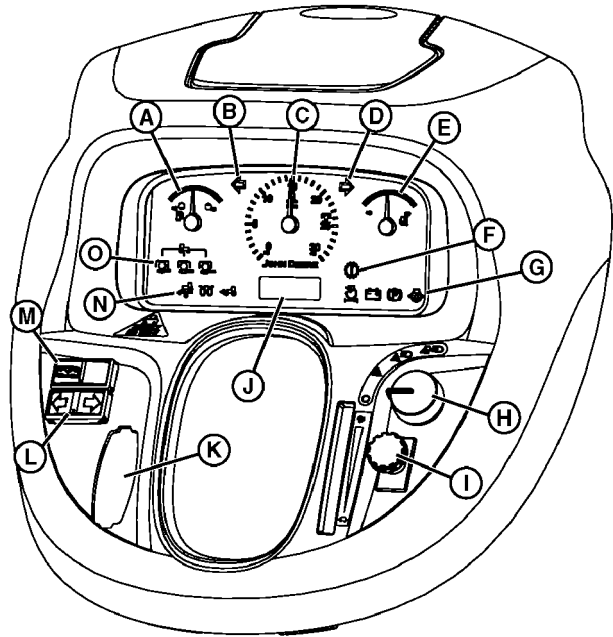
H—F7—Fuse 20A
I—F8—Fuse 20A
J—F9—Fuse 20A
K—F10—Blank
L—F11—Fuse 10A
M—F12—Blank



KN52281,1004320 -19-16JAN13-1/1

Display Panel

- | | |
|------------------------------------|------------------------------|
| A—Fuel Gauge | I—Rear and Mid PTO Switch |
| B—Left Turn Indicator Light | J—LCD Display Panel |
| C—Engine Tachometer | K—Reverser Shift Lever (PRT) |
| D—Right Turn Indicator Light | L—Turn Signal Switch |
| E—Engine Coolant Temperature Gauge | M—Display Mode Switch |
| F—Malfunction Indicator Light | N—Indicator Lights |
| G—Indicator Lights | O—Rear—Mid—Front |
| H—Light Switch | |

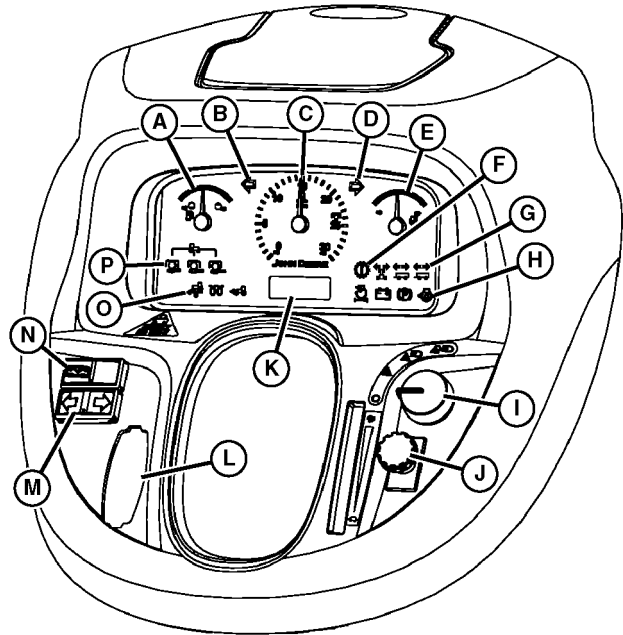


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KN52281,1004266 -19-04OCT12-1/1

Display Panel—MY13

- | | |
|------------------------------------|------------------------------|
| A—Fuel Gauge | I—Light Switch |
| B—Left Turn Indicator Light | J—Rear and Mid PTO Switch |
| C—Engine Tachometer | K—LCD Display Panel |
| D—Right Turn Indicator Light | L—Reverser Shift Lever (PRT) |
| E—Engine Coolant Temperature Gauge | M—Turn Signal Switch |
| F—Malfunction Indicator Light | N—Display Mode Switch |
| G—Bulb Integrity Indicator Lights | O—Indicator Lights |
| H—Indicator Lights | P—Rear—Mid—Front |



LVAL38744 —UN—15OCT12

KN52281,1004321 -19-16JAN13-1/1

Main Schematic and Wiring Harness Legend—PRT and eHydro™

Model 2007 Serial Number Breaks

Model	Transmission	Serial Number
3120	eHydro™	-410000
3320	eHydro™	-420000
3320	PRT	-427000
3520	eHydro™	-450000
3520	PRT	-460000
3520	eHydro™	-465000

Schematic and Wiring Harness Legend

A1—Display Panel

B1—Air Filter Restriction Switch

B2—Engine Oil Pressure Switch

B3—Engine Coolant Temperature Sensor

B4—Fuel Gauge Sensor

E1—Left Headlight

E2—Right Headlight

E3—Right Work Light

E4—Left Work Light

E5—Right Hazard Light

E6—Left Hazard Light

E7—Right Turn Light

E8—Left Turn Light

F1—Fusible Link

F2—Fusible Link

F3—Fuse 30A

F4—Not Used

F5—Fuse 30A

F6—Not Used

F7—Fuse 20A

F8—Fuse 20A

F9—Fuse 20A

F10—Not Used

F11—Fuse 10A

G1—Battery

G2—Alternator

K1—Fuel Relay

K2—Start Relay

K3—Manifold Heater Relay

M1—Starting Motor

M2—Fuel Pump

R1—Manifold Heater

S1—Key Switch

S2—Light Switch

S3—Rear PTO Switch

S4—Display Mode Switch

S5—Turn Signal Switch

S6—Seat Switch

S7—MFWD Engagement Sensing Switch

S8—Park Brake Switch

S9—Mid PTO Switch

S10—Transmission Neutral Switch

S11—Rear PTO Sense Switch

W1—Battery/Frame Ground

Y1—Starting Motor Solenoid

Y2—Fuel Shutoff Solenoid

Y3—Rear PTO Solenoid

Connectors:

X1—W1 Main Wiring Harness to R1 Manifold Heater

X2—W1 Main Wiring Harness to Y2 Fuel Shutoff Solenoid

X3—W1 Main Wiring Harness to W2 Headlight Wiring Harness

X4—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness

X5—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness

X6—W1 Main Wiring Harness to Display Panel

X7—W1 Main Wiring Harness to Display Panel

X8—W1 Main Wiring Harness to W3 Jumper Plug (standard), S9 Mid PTO Switch (optional)

X9—W1 Main Wiring Harness to S10 Transmission Neutral Switch (PRT), W4 Jumper Plug (eHydro™)

X10—W1 Main Wiring Harness to Display Panel

X11—W1 Main Wiring Harness to Display Panel

X12—W1 Main Wiring Harness to E3 Right Work Light

X13—W1 Main Wiring Harness to E3 Right Work Light

X14—W1 Main Wiring Harness to E4 Left Work Light

Continued on next page

OUO1082,00030EF -19-28FEB12-1/2

X15—W1 Main Wiring Harness to E4 Left Work Light
 X16—W1 Main Wiring Harness to E5 Hazard Light
 X17—W1 Main Wiring Harness to E7 Right Tail/Turn Light
 X18—W1 Main Wiring Harness to E5/E7 Right Tail/Turn/Hazard Lights
 X19—W1 Main Wiring Harness to E6 Left Hazard Light
 X20—W1 Main Wiring Harness to E8 Left Tail/Turn Light
 X21—W1 Main Wiring Harness to E6/E8 Left Tail/Turn Hazard Lights

W2—Headlight Wiring Harness
 W3—Jumper Plug
 W4—Jumper Plug
 W5—Right Work Light Wiring Harness (optional)
 W6—Left Work Light Wiring Harness (optional)
 W7—Right Rear Lights Wiring Harness
 W8—Left Rear Lights Wiring Harness

Wiring Harnesses:

W1—Main Wiring Harness

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OUO1082,00030EF -19-28FEB12-2/2

eHydro™—Schematic and Wiring Harness Legend

A2—Electronic Drive Controller
 H1—Backup Alarm
 S12—Load Match Switch
 S13—Res/+, Set/- Switch (optional)
 S14—Cruise Control/Max Speed Switch (optional)
 S15—Motion Match Switch (optional)
 S16—Cruise Control Switch (standard)
 S17—Brake Switch
 T1—Forward Pedal Sensor
 T2—Throttle Position Sensor
 T3—MFWD Speed Sensor
 T4—Reverse Pedal Sensor
 Y4—Reverse Proportional Solenoid
 Y5—Forward Proportional Solenoid

Connectors:

X26—W9 eHydro™ Wiring Harness to A2 Electronic Drive Controller

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X27—W9 eHydro™ Wiring Harness-to-W10 Proportional Valve Wiring Harness

X28—W9 eHydro™ Wiring Harness-to-W11 Cruise Control Wiring Harness (standard)

X28—W9 eHydro™ Wiring Harness-to-W12 Cruise Control Wiring Harness (optional)

X29—W9 eHydro™ Wiring Harness-to-T1 Forward Pedal Sensor

X30—W9 eHydro™ Wiring Harness-to-T2 Throttle Position Sensor

X31—W9 eHydro™ Wiring Harness-to-T3 MFWD Speed Sensor

X32—W9 eHydro™ Wiring Harness-to-T4 Reverse Pedal Sensor

Wiring Harnesses:

W9—eHydro™ Wiring Harness

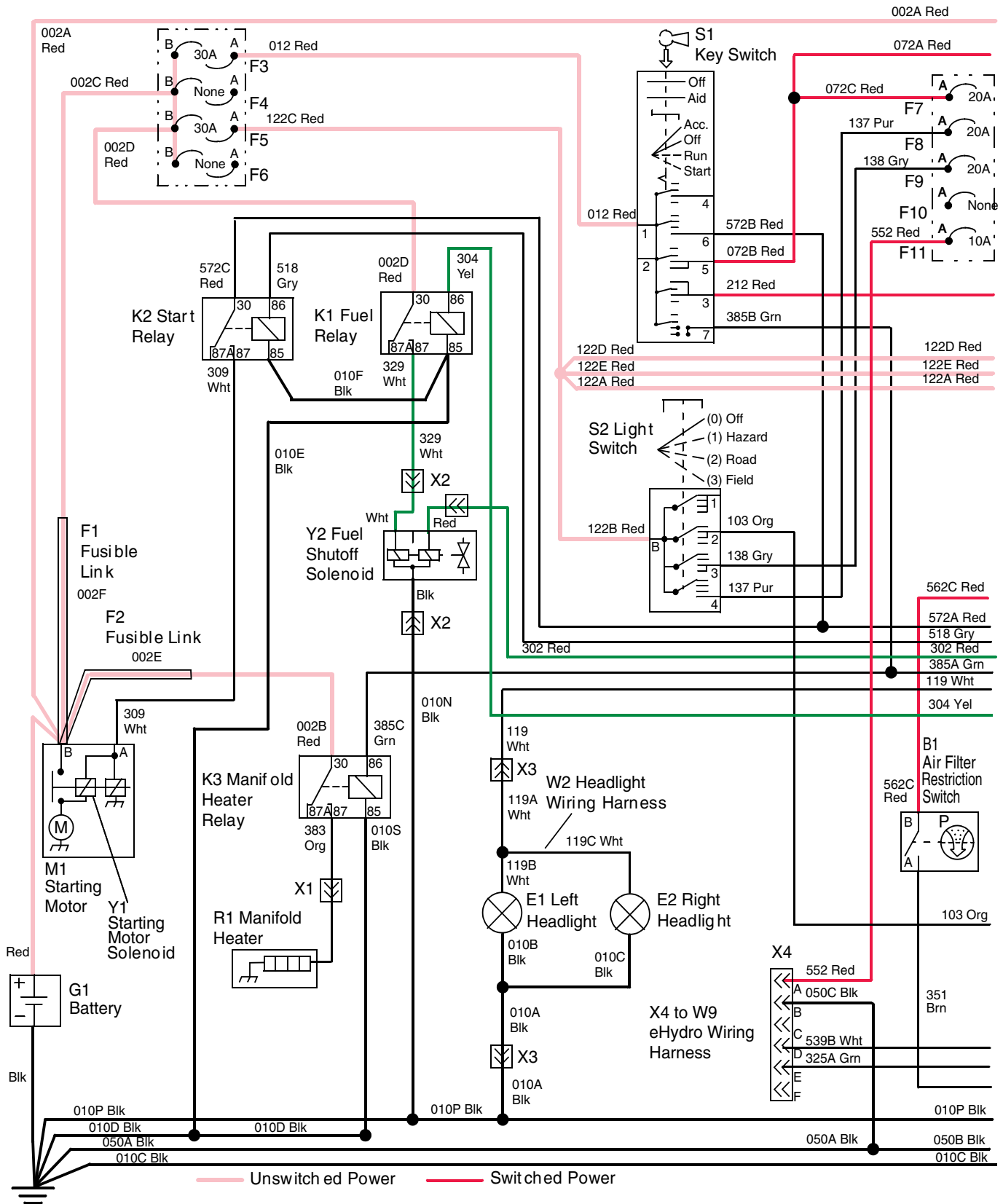
W10—Proportional Valve Wiring Harness

W11—Cruise Control Wiring Harness (standard)

W12—Cruise Control Wiring Harness (optional)

OUO1082,00030F0 -19-28FEB12-1/1

W1 Main Wiring Schematic—PRT and eHydro™ (Pre MY08)



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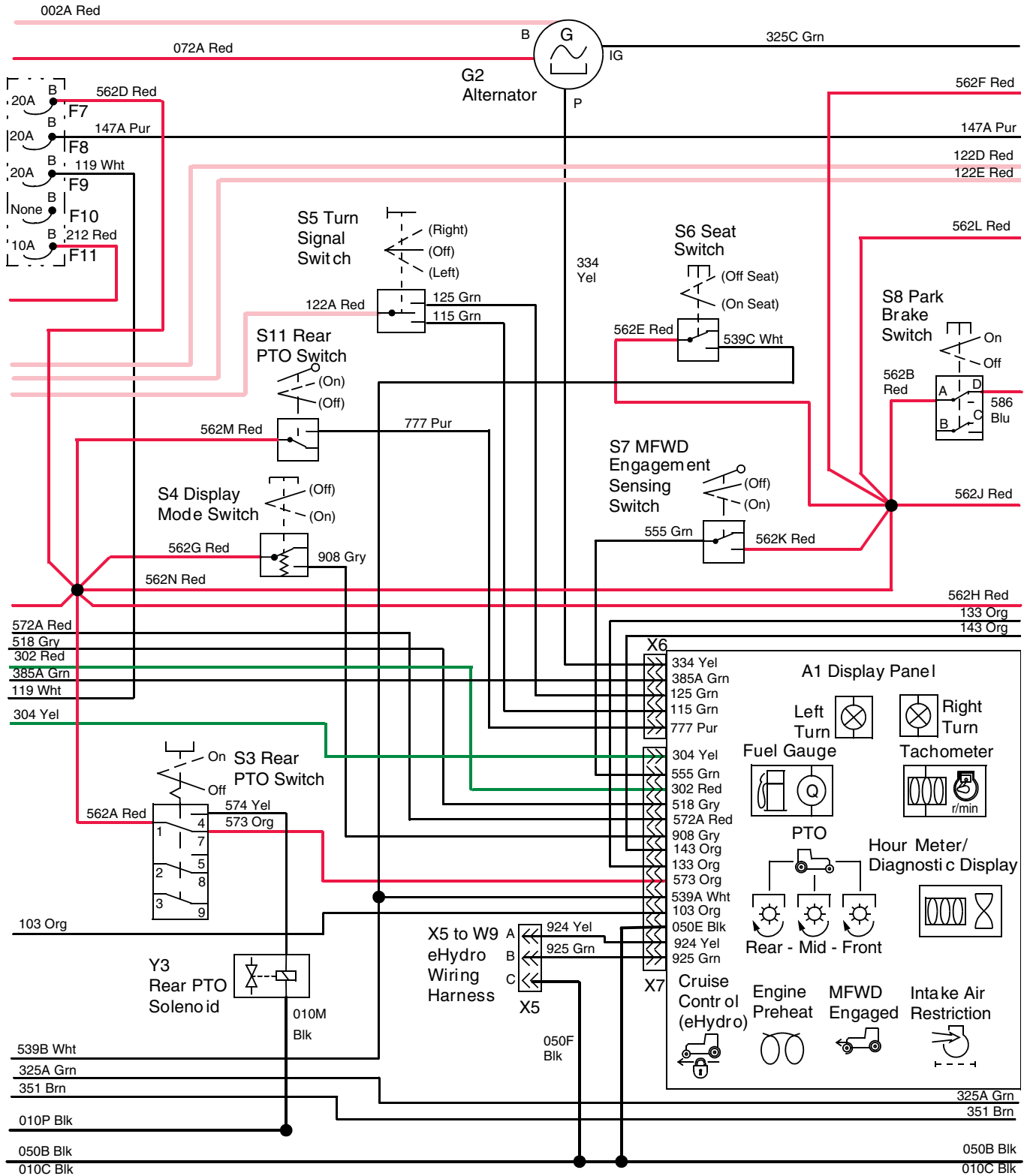
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B1—Air Filter Restriction Switch	F8— Fuse 20A	S2— Light Switch	X4— W1 Main Wiring
E1— Left Headlight	F9— Fuse 20A	X1— W1 Main Wiring	Harness-to-W9 eHydro™
E2— Right Headlight	F10— Not Used	Harness-to-R1 Manifold	Wiring Harness
F1— Fusible Link	F11— Fuse 10A	Heater	Y1— Starting Motor Solenoid
F2— Fusible Link	G1— Battery	X2— W1 Main Wiring	Y2— Fuel Shutoff Solenoid
F3— Fuse 30A	K1— Fuel Relay	Harness-to-Y2 Fuel Shutoff	
F4— Not Used	K2— Start Relay	Solenoid	
F5— Fuse 30A	K3— Manifold Heater Relay	X3— W1 Main Wiring	
F6— Not Used	M1— Starting Motor	Harness-to-W2 Headlight	
F7— Fuse 20A	R1— Manifold Heater	Wiring Harness	
	S1— Key Switch		

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OUC1082,00030F1 -19-02JAN13-2/6



LVAL11537-UN-02NOV10

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OUC1082,00030F1 -19-02JAN13-3/6

Schematics and Harnesses

A1—Display Panel
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A
F10— Not Used
F11— Fuse 10A
G2—Alternator
S3—Rear PTO Switch

S4— Display Mode Switch
S5— Turn Signal Switch
S6— Seat Switch
S7— MFWD Engagement Sensing
Switch
S8— Park Brake Switch

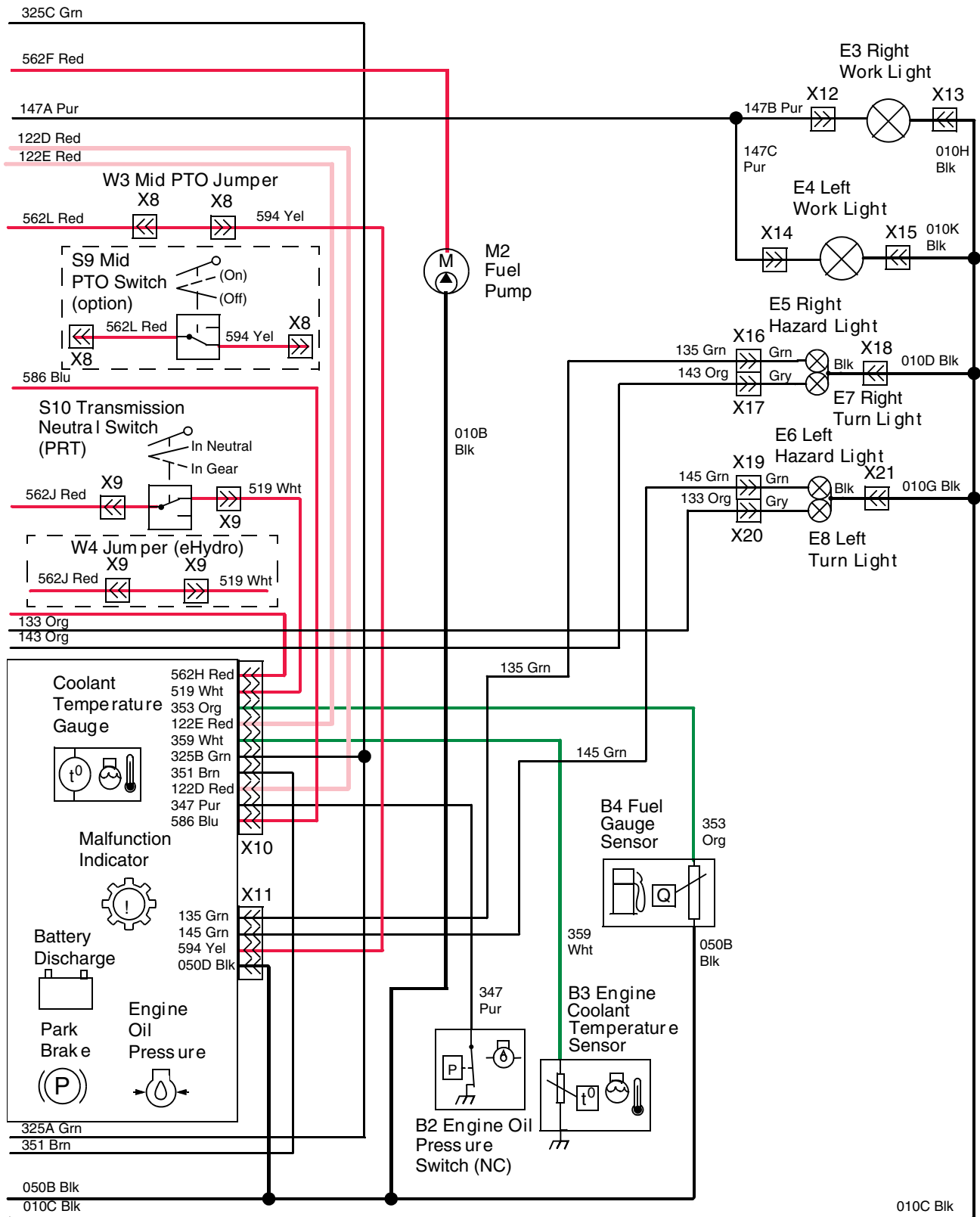
S11— Rear PTO Sense Switch
X5— W1 Main Wiring
Harness-to-W9 eHydro™
Wiring Harness

X6— W1 Main Wiring
Harness-to-Display Panel
X7— W1 Main Wiring
Harness-to-Display Panel
Y3—Rear PTO Solenoid

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OUC1082,00030F1 -19-02JAN13-4/6



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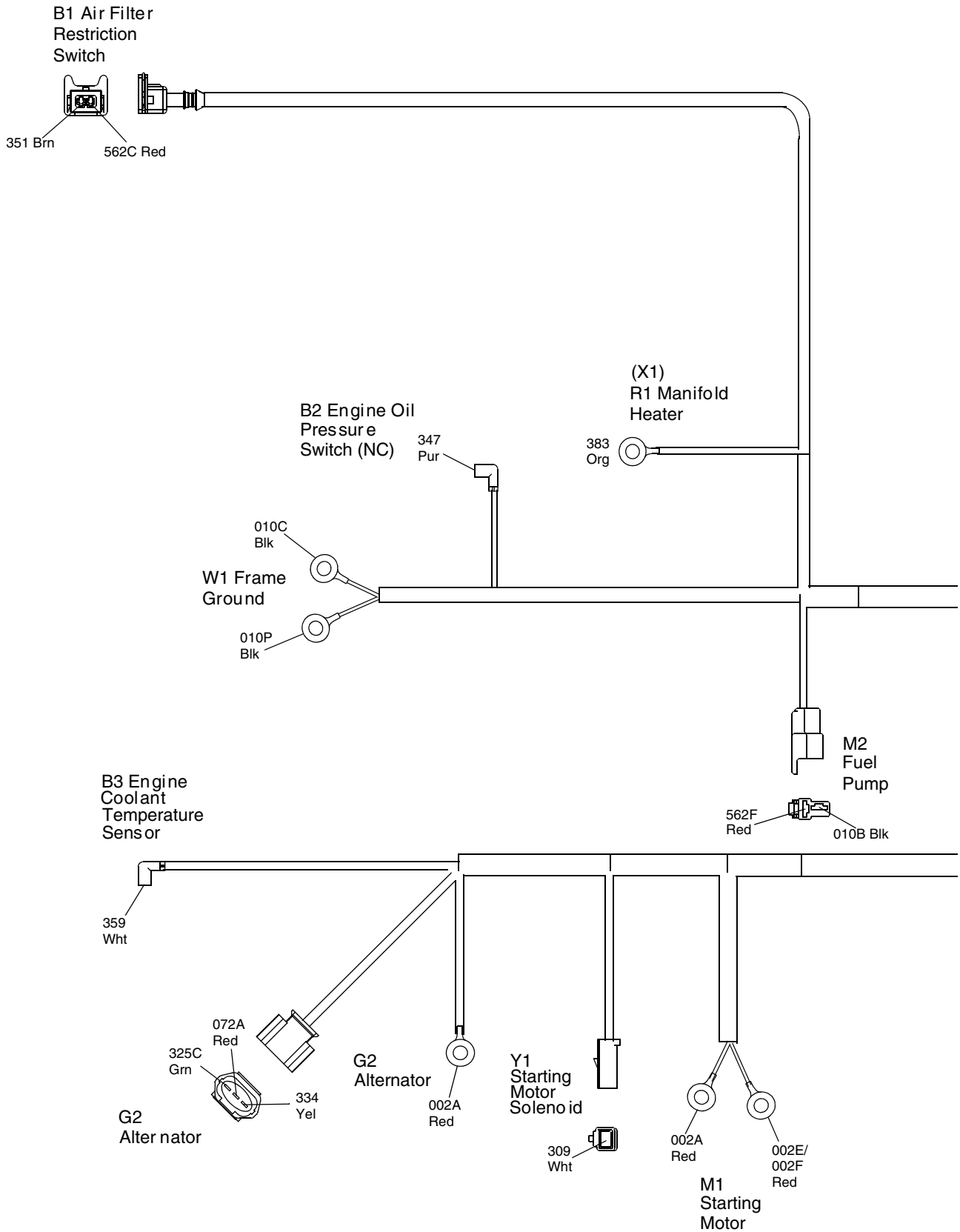
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OUO1082,00030F1 -19-02JAN13-5/6

B2—Engine Oil Pressure Switch (normally closed)	X8—W1 Main Wiring Harness to W3 Jumper Plug (standard), S9 Mid PTO Switch (optional)	X12— W1 Main Wiring Harness to E3 Right Work Light	X18— W1 Main Wiring Harness to E5/E7 Right Tail/Turn/Hazard Lights
B3—Engine Coolant Temperature Sensor	X9—W1 Main Wiring Harness to S10 Transmission Neutral Switch (PRT), W4 Jumper Plug (eHydro™)	X13— W1 Main Wiring Harness to E3 Right Work Light	X19— W1 Main Wiring Harness to E6 Left Hazard Light
B4—Fuel Gauge Sensor	X10— W1 Main Wiring Harness to Display Panel	X14— W1 Main Wiring Harness to E4 Left Work Light	X20— W1 Main Wiring Harness to E8 Left Tail/Turn Light
E3—Right Work Light	X11— W1 Main Wiring Harness to Display Panel	X15— W1 Main Wiring Harness to E4 Left Work Light	X21— W1 Main Wiring Harness to E6/E8 Left Tail/Turn/Hazard Lights
E4—Left Work Light		X16— W1 Main Wiring Harness to E5 Hazard Light	
E5—Right Hazard Light		X17— W1 Main Wiring Harness to E7 Right Tail/Turn Light	
E6—Left Hazard Light			
E7—Right Turn Light			
E8—Left Turn Light			
M2—Fuel Pump			
S9—Mid PTO Switch (option)			
S10— Transmission Neutral Switch (PRT)			

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OU01082,00030F1 -19-02JAN13-6/6

W1 Main Wiring Harness—PRT and eHydro™ (Pre MY08)

LVAL11539 —UN—02NOV10

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OUO1082,00030F2 -19-02JAN13-1/8

Schematics and Harnesses

B1—Air Filter Restriction Switch
B2—Engine Oil Pressure Switch
(normally closed)

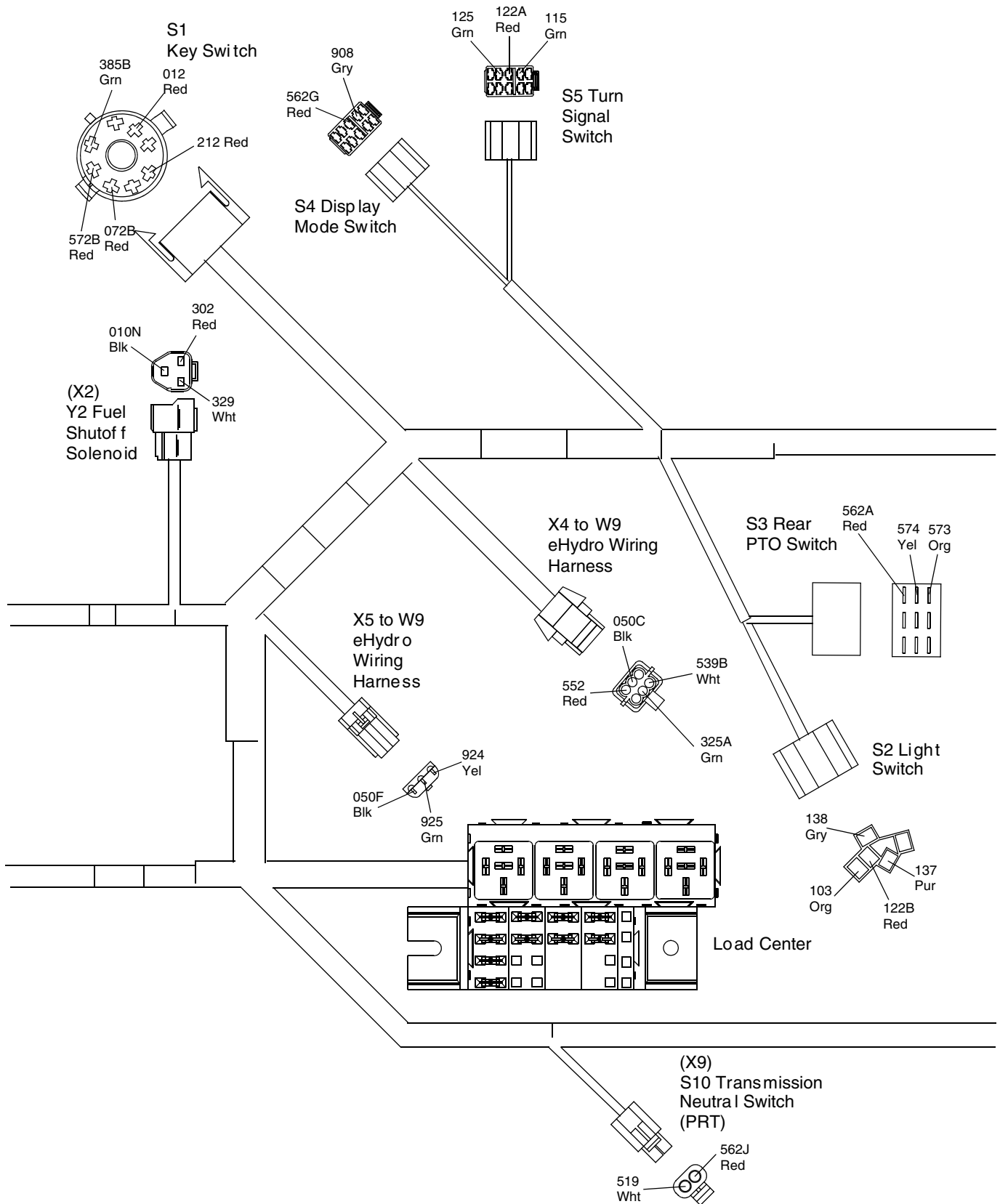
B3—Engine Coolant Temperature
Switch
G2—Alternator
M1—Starting Motor

M2—Fuel Pump
W1—Fame Ground
X1(R1)—W1 Main Wiring
Harness-to-R1 Manifold
Heater

Y1— Starting Motor Solenoid

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OUC1082,00030F2 -19-02JAN13-2/8



LVAL11540—UN—02NOV10

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OUC1082,00030F2 -19-02JAN13-3/8

Schematics and Harnesses

S1—Key Switch
S2—Light Switch
S3—Rear PTO Switch
S4—Display Mode Switch
S5—Turn Signal Switch
X2 (Y2)—W1 Main Wiring
Harness-to-Y2 Fuel
Shutoff Solenoid

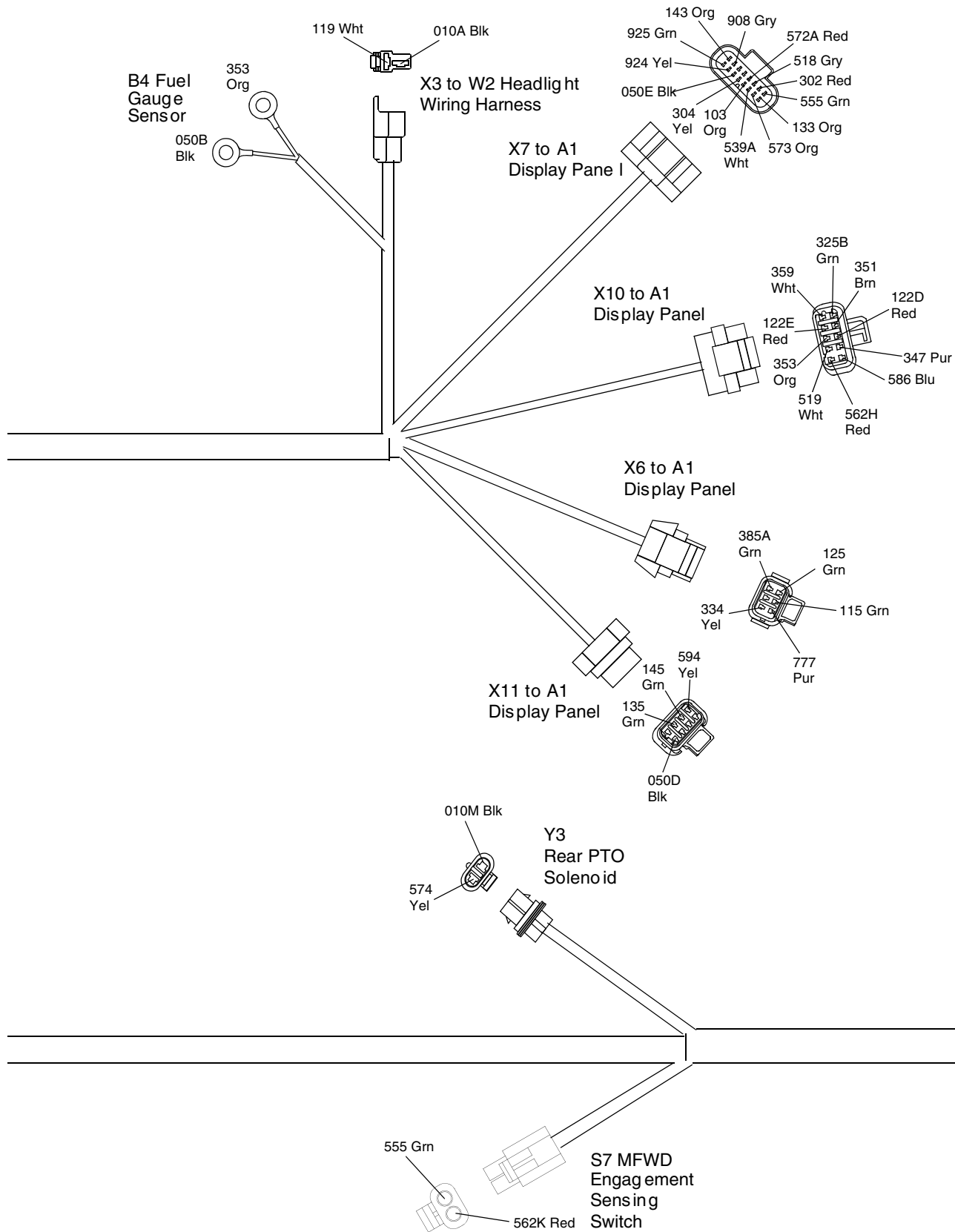
X4—W1 Main Wiring
Harness-to-W9 eHydro™
Wiring Harness
X5—W1 Main Wiring
Harness-to-W9 eHydro™
Wiring Harness

X9 (S10)—W1 Main Wiring
Harness-to-S10
Transmission Neutral
Switch (PRT), W4 Jumper
Plug (eHydro™)

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OUC1082,00030F2 -19-02JAN13-4/8



LVAL11541—UN—02NOV10

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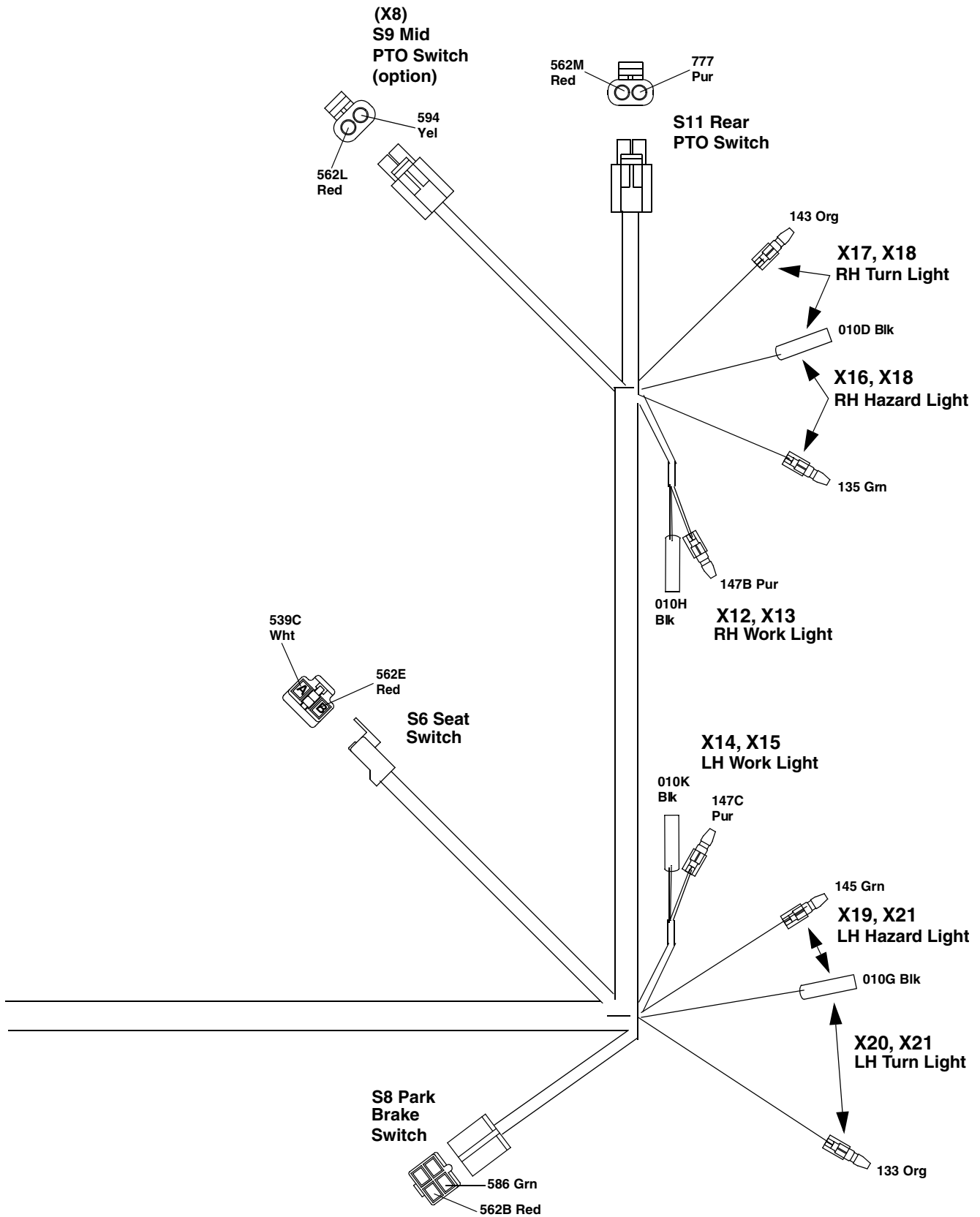
OUC1082,00030F2 -19-02JAN13-5/8

Schematics and Harnesses

B4—Fuel Gauge Sensor	X6—W1 Main Wiring	X10— W1 Main Wiring	Y3—Rear PTO Solenoid
S7—MFWD Engagement Sensing	Harness-to-A1 Display Panel	Harness-to-A1 Display	
Switch	X7—W1 Main Wiring	Panel	
X3—W1 Main Wiring	Harness-to-A1 Display Panel	X11— W1 Main Wiring	
Harness-to-W2 Headlight		Harness-to-A1 Display	
Wiring Harness		Panel	

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OUC1082,00030F2 -19-02JAN13-6/8



LVAL11542—UN—17DEC10

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OUC1082,00030F2 -19-02JAN13-7/8

X8 (S9)—W1 Main Wiring Harness-to-W3 Jumper Plug (standard), S9 Mid PTO Switch (optional)	X13— W1 Main Wiring Harness-to- E3 Right Work Light	X17— W1 Main Wiring Harness-to-E7 Right Tail/Turn Light	X21— W1 Main Wiring Harness-to-E6/E8 Left Tail/Turn/Hazard Lights
S6— Seat Switch	X14— W1 Main Wiring Harness-to-E4 Left Work Light	X18— W1 Main Wiring Harness-to-E5/E7 Right Tail/Turn/Hazard Lights	
S8— Park Brake Switch	X15— W1 Main Wiring Harness-to-E4 Left Work Light	X19— W1 Main Wiring Harness-to- E6 Left Hazard Light	
S11— Rear PTO Sense Switch	X16— W1 Main Wiring Harness-to-E5 Right Hazard Light	X20— W1 Main Wiring Harness-to-E8 Left Tail/Turn Light	

OUO1082,00030F2 -19-02JAN13-8/8

W1 Main Wiring Harness Color Codes—PRT and eHydro™ (Pre MY08)

Size/No./Color	Wire Connection Points
5.0 002A Red	Y1, G2
5.0 002B Red	F2 Fusible Link, K3
5.0 002C Red	F1 Fusible Link, Fuse Block
5.0 002D Red	Fuse Block, K1
2.0 002E Fuse Link	(F2 Fusible Link) Splice, M1
2.0 002F Fuse Link	(F1 Fusible Link) Splice, M1
1.0 010A Blk	X3, Splice
0.8 010B Blk	M2, Splice
3.0 010C Blk	Splice, W1
0.8 010D Blk	W1, Splice
0.5 010E Blk	K1, Splice
0.5 010F Blk	K1, K2
0.8 010G Blk	X21, Splice
1.0 010H Blk	X13, Splice
1.0 010K Blk	X15, Splice
0.8 010M Blk	Y3, Splice
3.0 10N Blk	X2, Splice
3.0 010P Blk	W1, Splice
0.5 010S Blk	K3, Splice
3.0 012 Red	Fuse Block, S1
2.0 050A Blk	W1, Splice
0.5 050B Blk	Splice, B4
0.8 050C Blk	X4, Splice
0.8 050D Blk	X11, Splice
0.8 050E Blk	X7, Splice
0.5 050F Blk	Splice, X5
0.8 072A Red	Splice, G2
1.0 072B Red	S1, Splice
1.0 072C Red	Splice, Fuse Block
0.8 103 Org	S2, X7
0.5 115 Grn	S5, X6
1.0 119 Wht	Fuse Block, X3
0.8 122A Red	Splice, S5
3.0 122B Red	Splice, S2
3.0 122C Red	Fuse Block, Splice
1.0 122D Red	Splice, X10
1.0 122E Red	Splice, X10
0.5 125 Grn	S5, X6
0.8 133 Org	X7, X20
0.8 135 Grn	X11, X16
1.0 137 Pur	S2, Fuse Block
2.0 138 Gry	S2, Fuse Block
0.8 143 Org	X7, X17
0.8 145 Grn	X11, X19
2.0 147A Pur	Fuse Block, Splice
1.0 147B Pur	Splice, X12
1.0 147C Pur	Splice, X14
1.0 212 Red	Fuse Block, S1
1.0 302 Red	X2, X7
0.5 304 Yel	K1, X7

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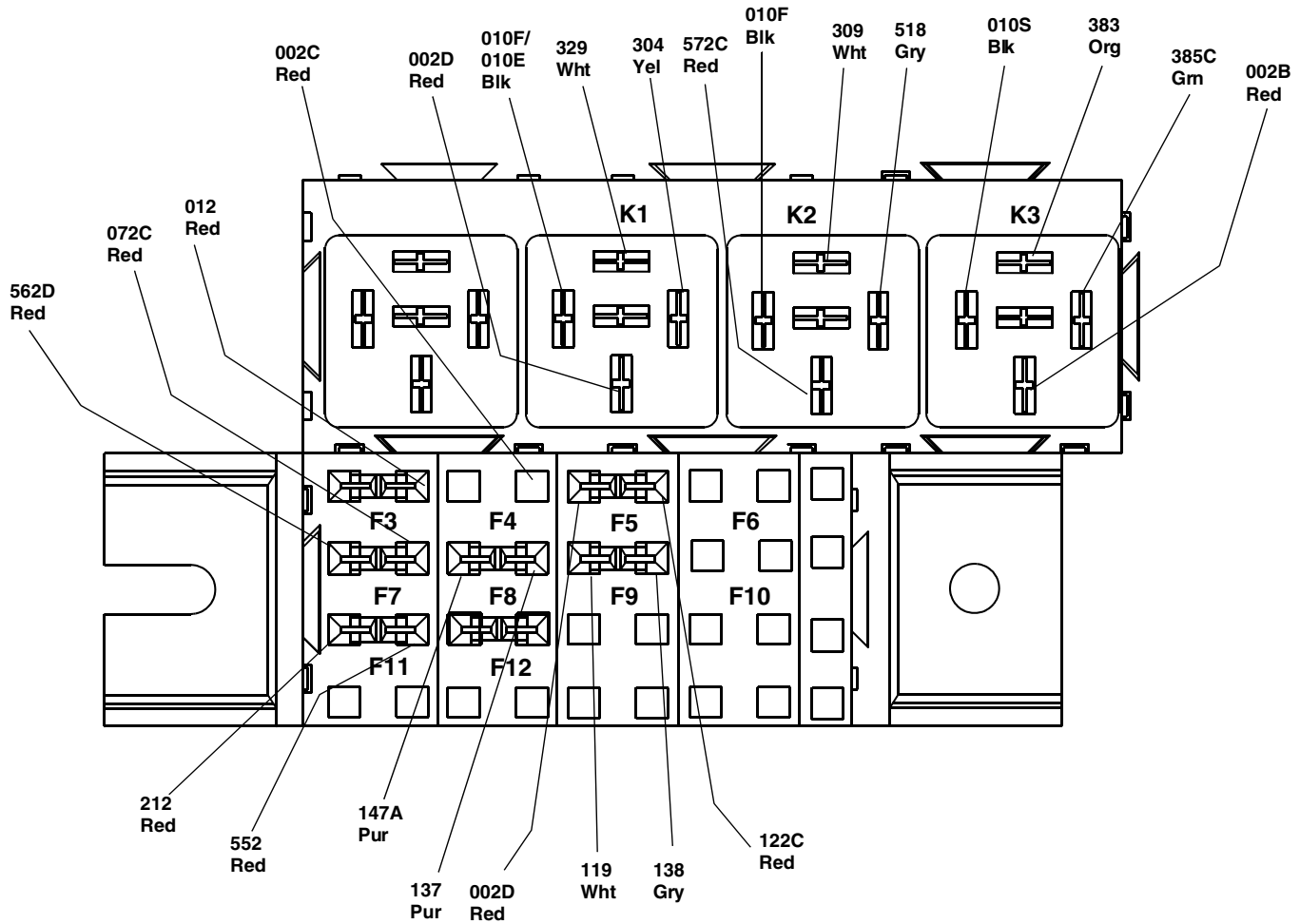
OUO1082,00030F3 -19-28FEB12-1/2

Schematics and Harnesses

Size/No./Color	Wire Connection Points
2.0 309 Wht	Y1, K2
0.8 325A Grn	X4, Splice
0.8 325B Grn	Splice, X10
0.8 325C Grn	Splice, G2
3.0 329 Wht	K1, X2
0.8 334 Yel	G2, X6
0.5 347 Pur	X10, B2
0.5 351 Brn	B1, X10
0.5 353 Org	X10, B3
0.5 359 Wht	X10, B3
2.0 383 Org	K3, X1
0.8 385A Grn	Splice, X6
0.8 385B Grn	S1, Splice
0.8 385C Grn	K3, Splice
0.5 518 Gry	K2, X7
0.5 519 Wht	X9, X10
0.5 539A Wht	X7, Splice
0.5 539B Wht	X4, Splice
0.5 539C Wht	Splice, S6
0.5 552 Red	X4, Fuse Block
0.5 555 Grn	S7, X7
0.8 562A Red	Splice, S3
0.5 562B Red	Splice, S8
0.5 562C Red	Splice, B1
1.0 562D Red	Fuse Block, Splice
0.5 562E Red	S6, Splice
0.8 562F Red	Splice, M2
0.5 562G Red	Splice, S4
0.8 562H Red	Splice, X10
0.5 562J Red	Splice, X9
0.5 562K Red	S7, Splice
0.5 562L Red	Splice, X8
0.5 562M Red	S11, Splice
0.8 562N Red	Splice, Splice
0.5 572A Red	Splice, X7
1.0 572B Red	S1, Splice
1.0 572C Red	K2, Splice
0.5 573 Org	S3, X7
0.8 574 Yel	S3, Y3
0.5 586 Blu	S8, X10
0.5 594 Yel	X8, X11
0.5 777 Pur	S11, X6
0.5 908 Gry	S4, X7
0.5 924 Yel	X5, X7
0.5 925 Grn	X5, X7

OUO1082,00030F3 -19-28FEB12-2/2

Load Center—PRT and eHydro™

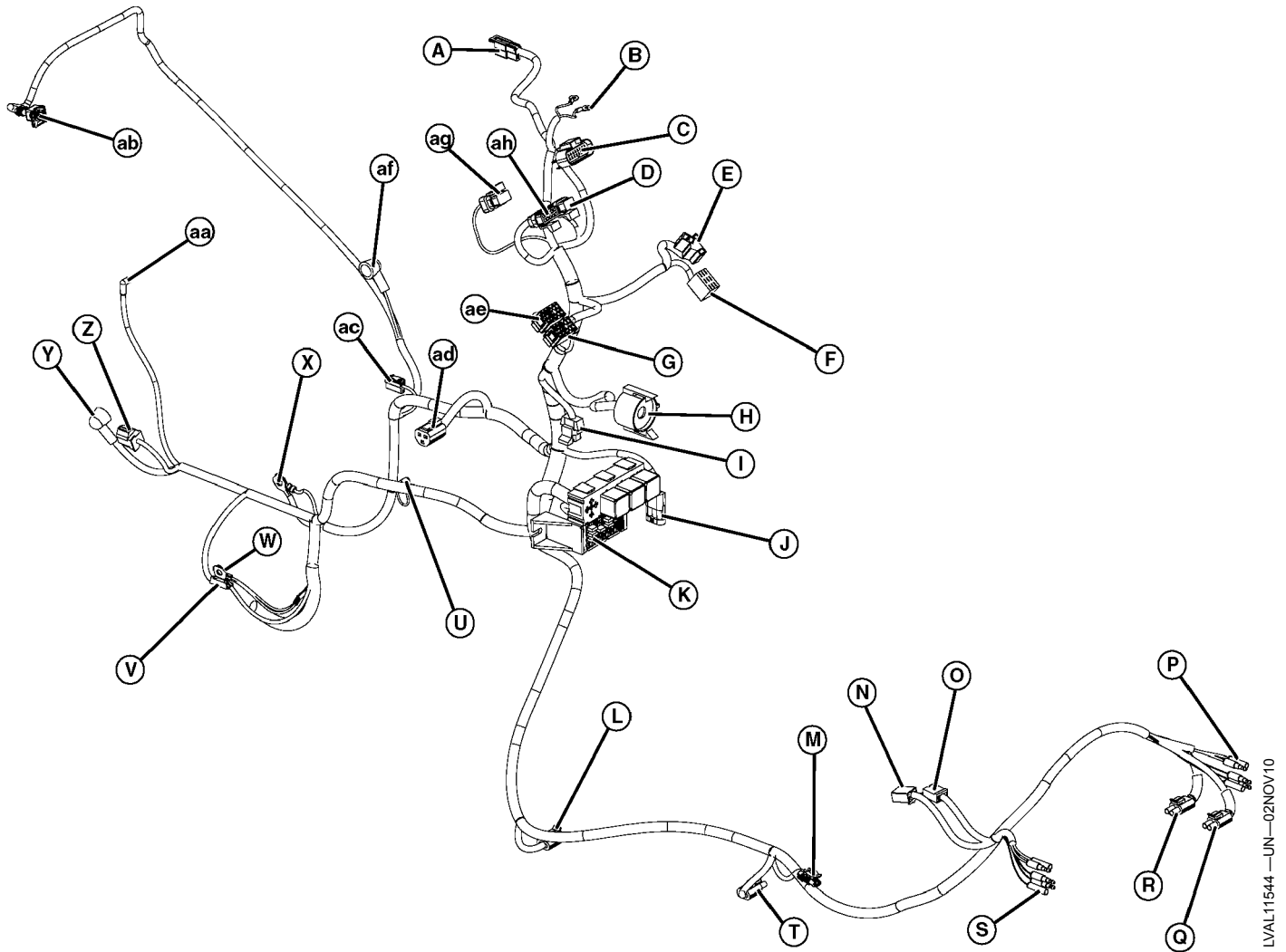


002B RED—Terminal 30 of K3 Manifold Heater Relay	010S BLK—Terminal 85 of K3 Manifold Heater Relay	147A PUR—Terminal B of Fuse F8	385C GRN—Terminal 86 of K3 Manifold Heater Relay
002C RED—Terminal B of Fuse F4	012 RED—Terminal A of Fuse F3	212 RED—Terminal B of Fuse F11	518 GRY—Terminal 86 of K2 Start Relay
002D RED—Terminal B of Fuse F5	072C RED—Terminal A of Fuse F7	304 YEL—Terminal 86 of K1 Fuel Relay	552 RED—Terminal A of Fuse F11
002D RED—Terminal 30 of K1 Fuel Relay	119 WHT—Terminal B of Fuse F9	309 WHT—Terminal 87 of K2 Start Relay	562D RED—Terminal B of Fuse F7
010F BLK—Terminal 85 of K2 Start Relay	122C RED—Terminal A of Fuse F5	329 WHT—Terminal 87 of K1 Fuel Relay	572C RED—Terminal 30 of K2 Start Relay
010F/010E BLK—Terminal 85 of K1 Fuel Relay	137 PUR—Terminal A of Fuse F8	383 ORG—Terminal 87 of K3 Manifold Heater Relay	
	138 GRY—Terminal A of Fuse F9		

LVAL11543—UN—02NOV10

OUO1082,00030F4 -19-28FEB12-1/1

W1 Main Wiring Harness Component Location—PRT, eHydro™, and Auto HST



Left Rear View

A—X3 Connector-to-W2 Headlight Wiring Harness
 B—B4 Fuel Gauge Sensor
 C—X7 Connector-to-A1 Display Panel
 D—X6 Connector-to-A1 Display Panel
 E—S2 Light Switch
 F—S3 Rear PTO Switch
 G—S5 Turn Signal Switch
 H—S1 Key Switch
 I—X4 Connector-to-W9 eHydro™ Wiring Harness

J—X5 Connector-to-Diagnostic Interface-to-W9 eHydro™ Wiring Harness
 K—Load Center
 L—S10 Transmission Neutral Switch (PRT) or X9 Connector-to-W4 Jumper Harness (eHydro™)
 M—Y3 Rear PTO Solenoid
 N—S8 Park Brake Switch
 O—S6 Seat Switch
 P—RH Tail/Warning Lights Connectors-to-W8 Right Rear Lights Wiring Harness

Q—S11 Rear PTO Sense Switch
 R—S9 Mid PTO Switch or X8 Connector-to-Mid PTO Jumper
 S—LH Tail/Warning Lights Connectors-to-W7 Left Rear Lights Wiring Harness
 T—S7 MFWD Engagement Sensing Switch
 U—B2 Engine Oil Pressure Switch
 V—Y1 Starting Motor Solenoid
 W—Y1 Starting Motor Solenoid Battery+
 X—W1 Ground

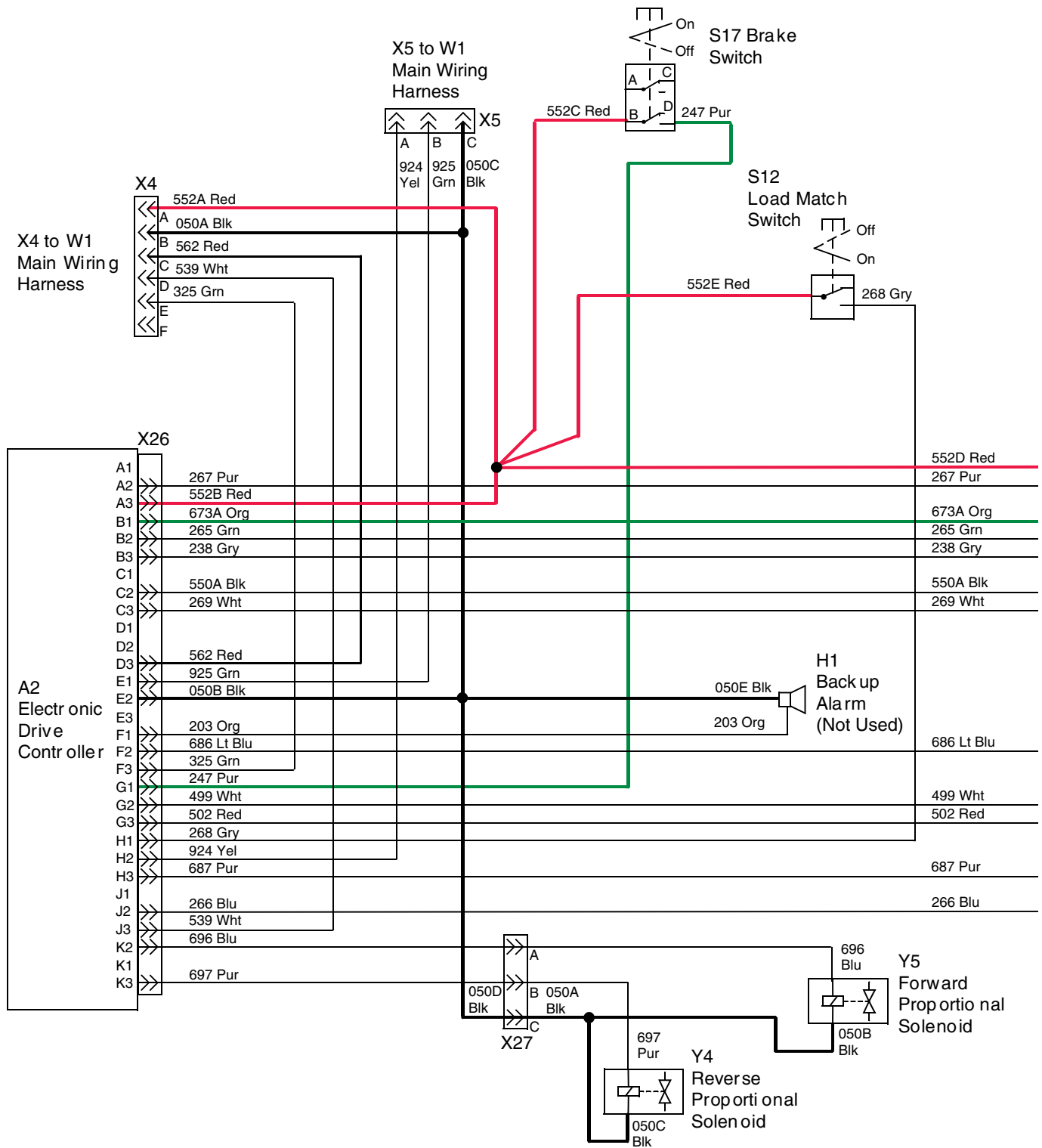
Y—G2 Alternator Battery+
 Z—G2 Alternator
 AA—B3 Engine Coolant Temperature Sensor
 AB—B1 Air Filter Restriction Switch
 AC—M2 Fuel Pump
 AD—Y2 Fuel Shutoff Solenoid
 AE—S4 Display Mode Switch
 AF—R1 Manifold Heater
 AG—X11 Connector-to-A1 Display Panel
 AH—X10 Connector-to-A1 Display Panel

eHydro is a trademark of Deere & Company

LVAL11544 —UN—02NOV10

OUC1082,00030F5 -19-02JAN13-1/1

W9 eHydro™ and Cruise Control Electrical Schematic (1 of 2)—Pre MY08



LVAL11545 —UN—02NOV10

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OUO1082,00030F6 -19-28FEB12-1/4

Schematics and Harnesses

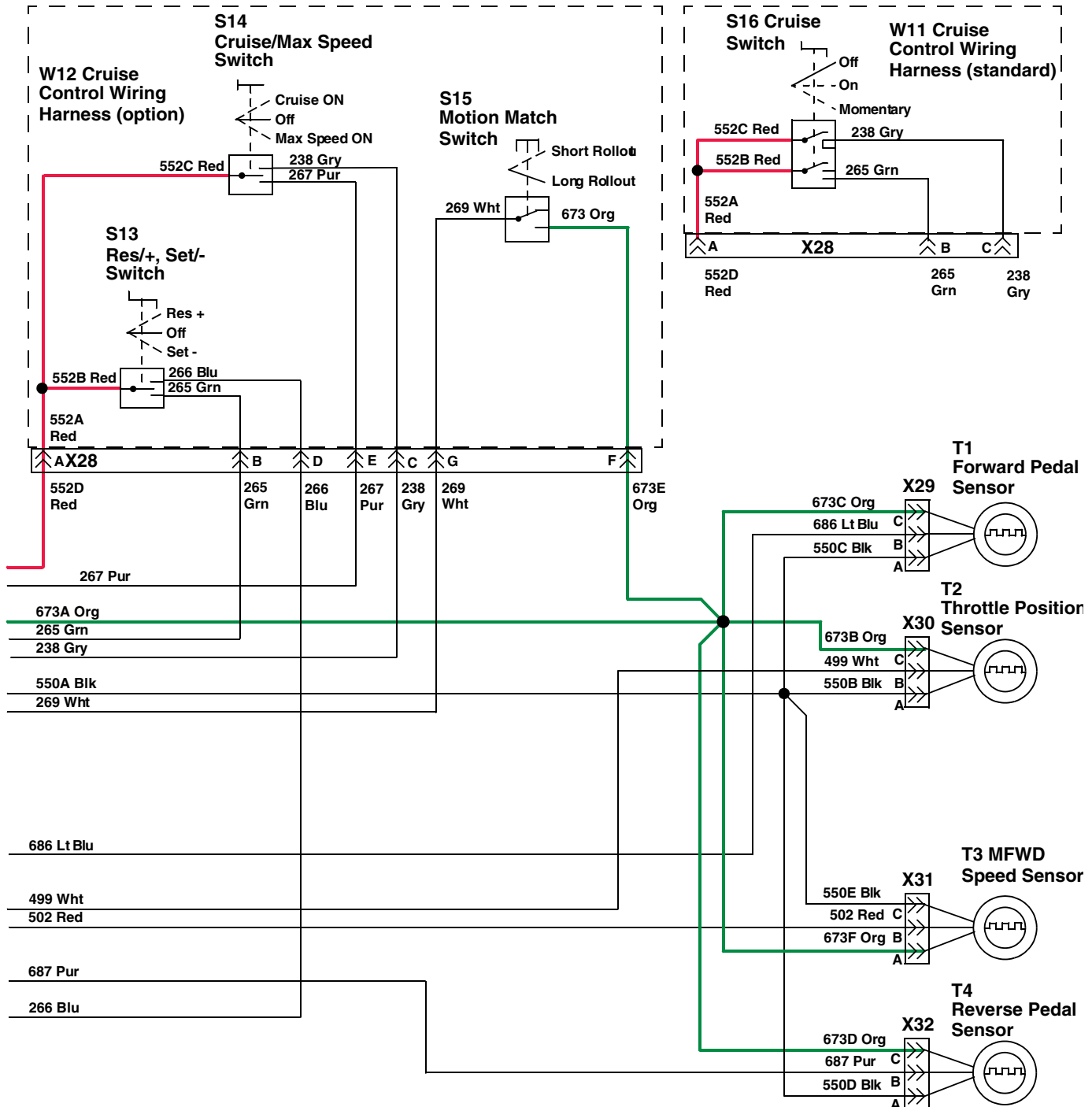
A2—Electronic Drive Controller	X5—W1 Main Wiring	X27— W9 eHydro™ Wiring
H1—Backup Alarm (not used)	Harness-to-W9 eHydro™	Harness-to-W10
S12— Load Match Switch	Wiring Harness	Proportional Valve Wiring
S17— Brake Switch	X26— W9 eHydro™ Wiring	Harness
X4—W1 Main Wiring	Harness-to-A2 Electronic	Y4—Reverse Proportional
Harness-to-W9 eHydro™	Drive Controller	Solenoid
Wiring Harness		Y5—Forward Proportional
		Solenoid

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OUC1082,00030F6 -19-28FEB12-2/4

W9 eHydro™ and Cruise Control Electrical Schematic (2 of 2)



LVAL11546—UN—02NOV10

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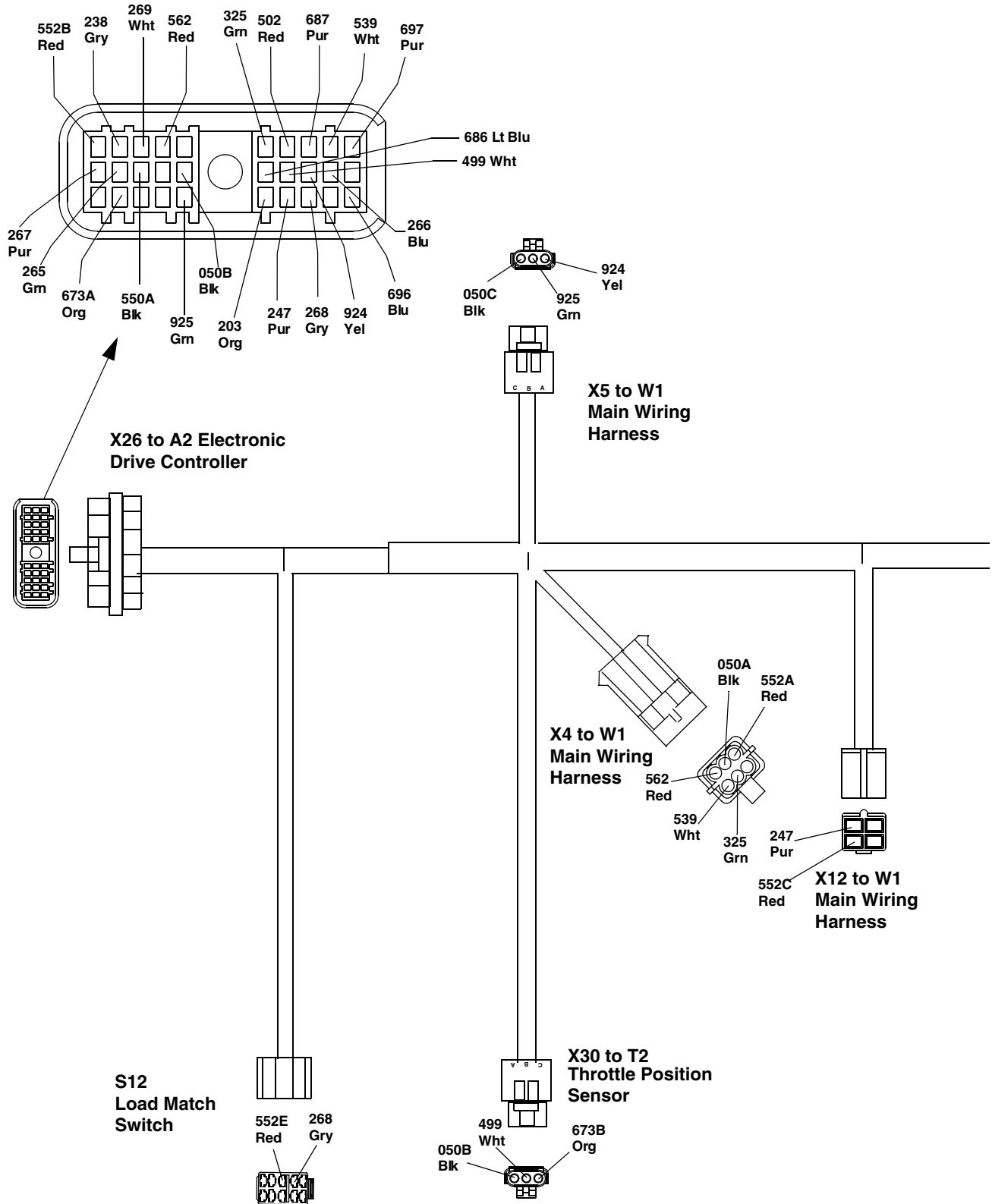
OUO1082,00030F6 -19-28FEB12-3/4

S13— Res/+, Set/- Switch (optional)	T2— Throttle Position Sensor	X29— W9 eHydro™ Wiring Harness-to-T1 Forward Pedal Sensor	X32— W9 eHydro™ Wiring Harness-to-T4 Reverse Pedal Sensor
S14— Cruise Control/Max Speed Switch (optional)	T3— MFWD Speed Sensor		
S15— Motion Match Switch (optional)	T4— Reverse Pedal Sensor	X30— W9 eHydro™ Wiring Harness-to-T2 Throttle Position Sensor	
S16— Cruise Control Switch (standard)	W11— Cruise Control Wiring Harness (standard)	X31— W9 eHydro™ Wiring Harness-to-T3 MFWD Speed Sensor X32 - W9	
T1— Forward Pedal Sensor	W12— Cruise Control Wiring Harness (optional)		
	X28— W9 eHydro™ Wiring Harness to W12 Cruise Control Wiring Harness (optional)		

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OUO1082,00030F6 -19-28FEB12-4/4

W9 eHydro™ Wiring Harness—Pre MY08



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OUO1082,00030F7 -19-02JAN13-1/4

Schematics and Harnesses

S12— Load Match Switch
X4— W1 Main Wiring
Harness-to-W9 eHydro™
Wiring Harness

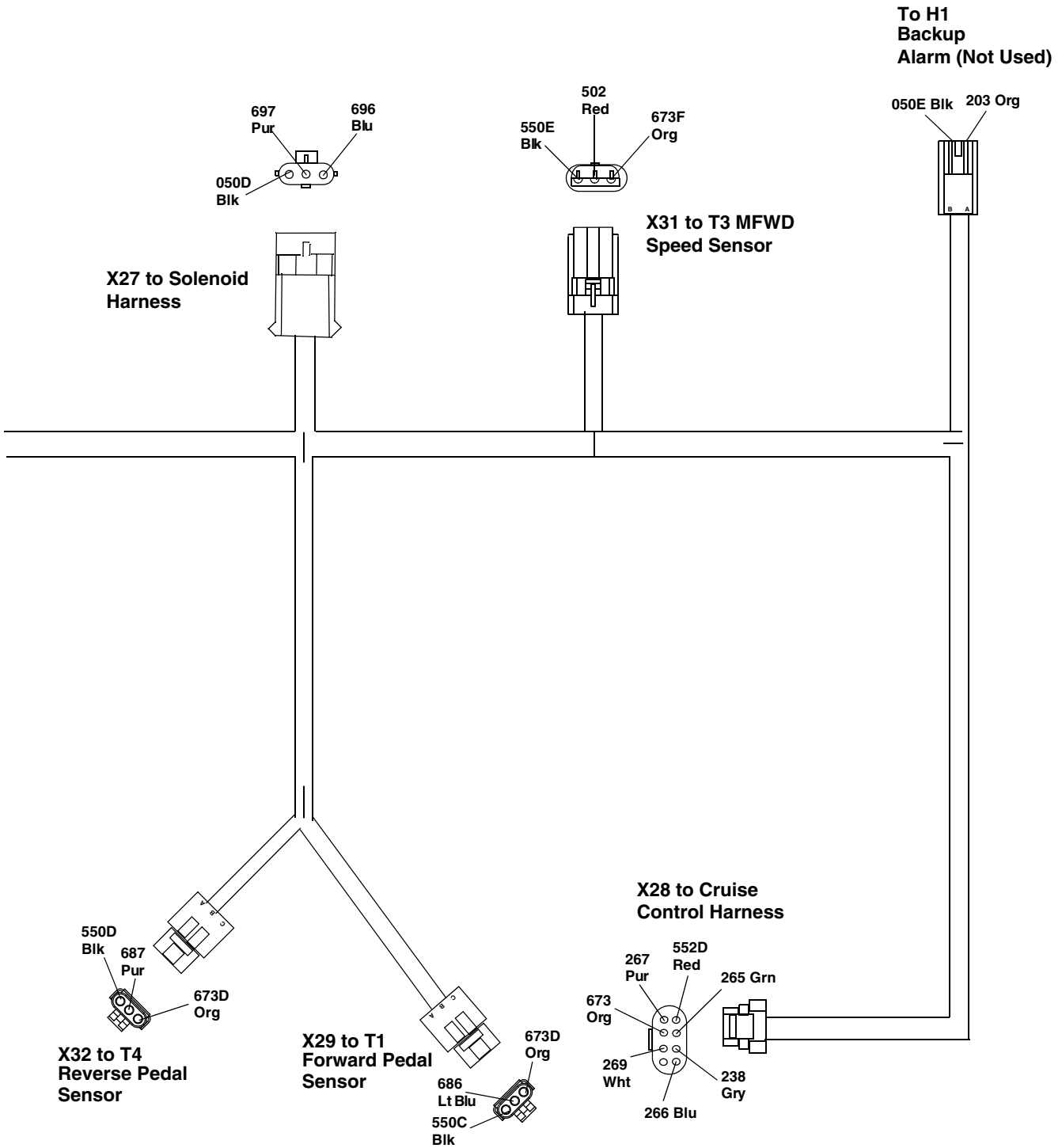
X5— W1 Main Wiring
Harness-to-W9 eHydro™
Wiring Harness
X12— W1 Main Wiring
Harness-to-E3 Right Work
Light

X26— W9 eHydro™ Wiring
Harness-to-A2 Electronic
Drive Controller
X30— W9 eHydro™ Wiring
Harness-to-T2 Throttle
Position Sensor

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OUO1082,00030F7 -19-02JAN13-2/4



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OUC1082,00030F7 -19-02JAN13-3/4

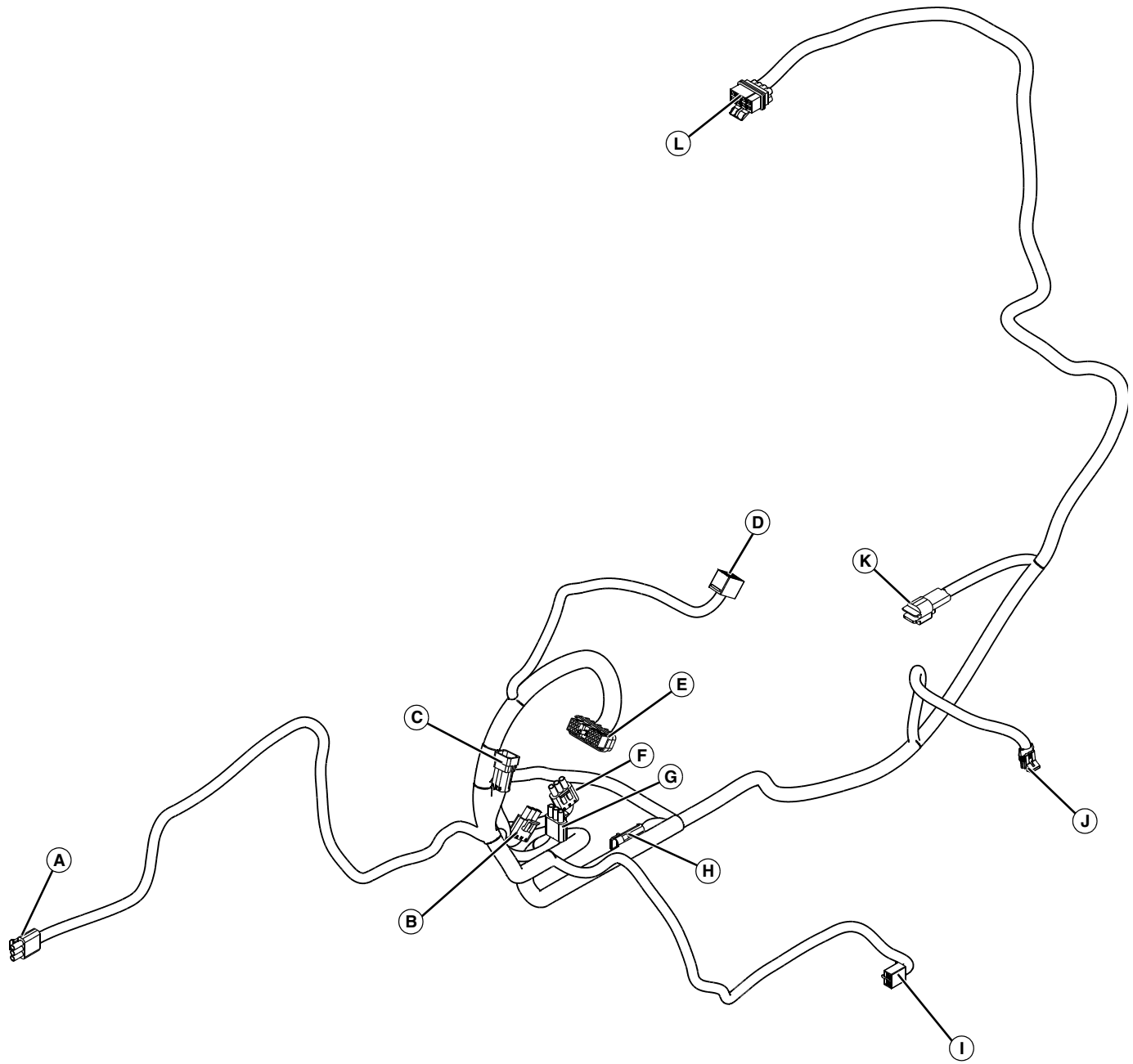
Schematics and Harnesses

H1—Backup Alarm (not used)	X28— W9 eHydro™ Wiring Harness-to-W11 Cruise Control Wiring Harness	X31— W9 eHydro™ Wiring Harness-to-T3 MFWD Speed Sensor
X27— W9 eHydro™ Wiring Harness-to-W10 Proportional Valve Wiring Harness	X29— W9 eHydro™ Wiring Harness-to-T1 Forward Pedal Sensor	X32— W9 eHydro™ Wiring Harness-to-T4 Reverse Pedal Sensor

eHydro is a trademark of Deere & Company

OUO1082,00030F7 -19-02JAN13-4/4

W9 eHydro™ Wiring Harness Component Location—Pre MY08



Left Front View

- | | | |
|--|--|---|
| A—T2 Throttle Position Sensor | E—A2 Electronic Drive Controller | I— S17 Brake Switch |
| B—T1 Forward Pedal Sensor | F—T4 Reverse Pedal Sensor | J— T3 MFWD Speed Sensor |
| C—X4 Connector-to-W1 Main Wiring Harness | G—X5 Connector-to-W1 Main Wiring Harness | K—H1 Backup Alarm (not used) |
| D—S12 Load Match Switch | H—X27 Connector-to-W10 Proportional Valve Wiring Harness | L—X28 Connector-to-W11 or W12 Cruise Control Wiring Harness |

LVAL11549 —UN—02NOV10

OUC1082,00030F8 -19-02JAN13-1/1

W9 eHydro™ Wiring Harness Color Codes—Pre MY08

Size/No./Color	Wire Connection Points
0.8 050A Blk	Splice 050, X4
0.5 050B Blk	Splice 050, X26
0.5 050C Blk	Splice 050, X5
0.5 050D Blk	Splice 050, X27
0.5 050E Blk	Splice 050, H1
0.8 203 Org	X26, H1
0.5 238 Gry	X26, X28
0.5 247 Pur	X26, S17
0.5 265 Grn	X26, X28
0.5 266 Blu	X26, X28
0.5 267 Pur	X26, X28
0.5 268 Gry	X26, S12
0.5 269 Wht	X26, X28
0.5 325 Grn	X26, X4
0.5 499 Wht	X26, T2
0.8 502 Red	X26, T3
0.5 539 Wht	X4, X26
0.8 550A Blk	Splice 550, X26
0.5 550B Blk	Splice 550, T2
0.5 550C Blk	Splice 550, T1
0.5 550D Blk	Splice 550, T4
0.5 550E Blk	Splice 550, T3
0.8 552A Red	Splice 552, X4
0.5 552B Red	Splice 552, X26
0.5 552C Red	Splice, S17
0.5 552D Red	Splice 552, X28
0.5 552E Red	Splice 552, S12
0.5 562 Red	X4, X26
0.8 673A Org	Splice 673, X26
0.5 673B Org	Splice 673, T2
0.5 673C Org	Splice 673, T1
0.5 673D Org	Splice 673, T4
0.5 673E Org	Splice 673, X28
0.5 673F Org	Splice 673, T3
0.5 686 Lt Blu	X26, T1
0.5 687 Pur	X26, T4
0.5 696 Blu	X26, X27
0.5 697 Pur	X26, X27
0.5 924 Yel	X26, X5
0.5 925 Grn	X26, X5

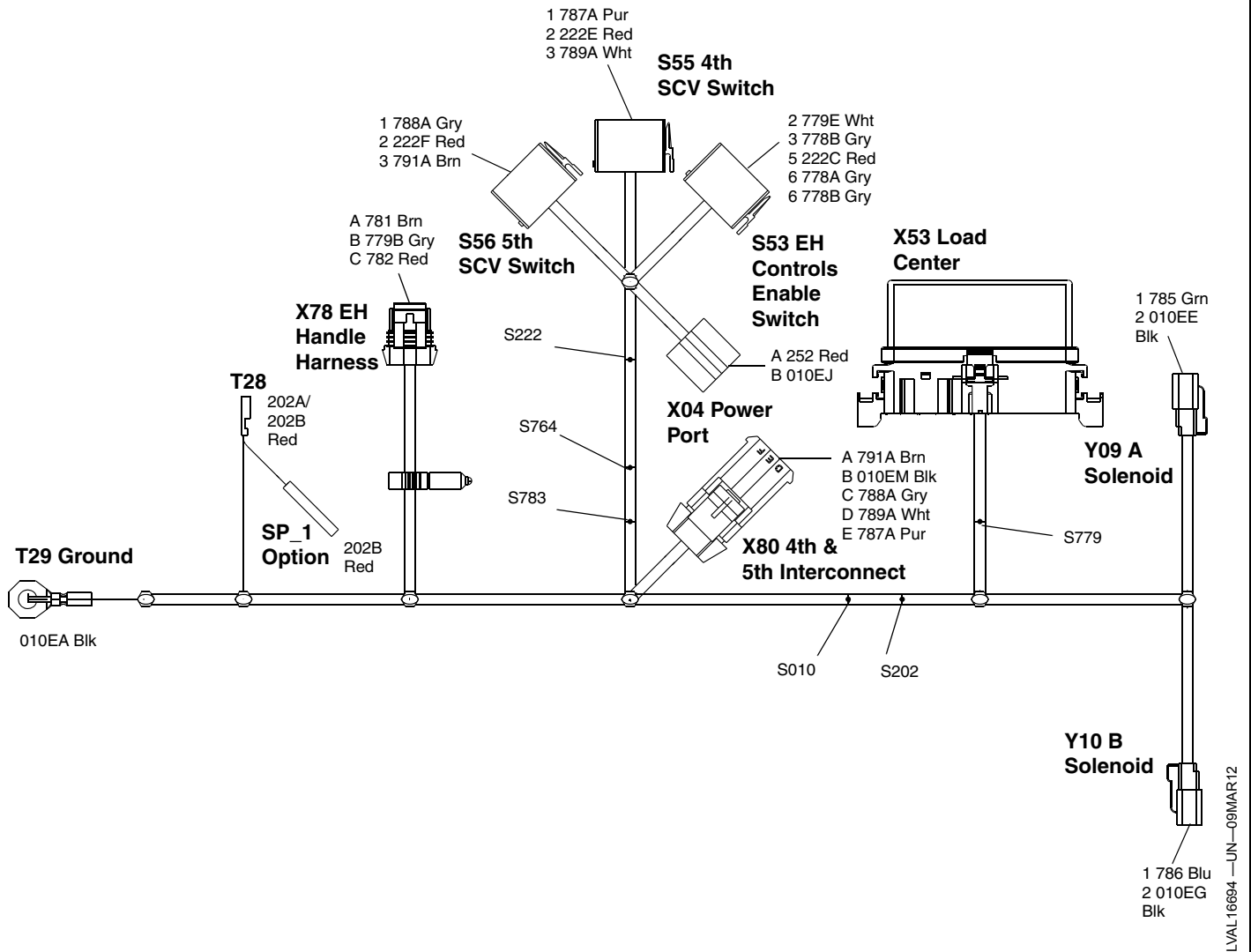
OUO1082,00030F9 -19-28FEB12-1/1

**W28 3rd, 4th and 5th Function Wiring
Harness Color Codes (SN 710001—)**

Size/No./Color	Wire Connection Points
1.0 010EA Blk	T29, Splice
0.8 010EB Blk	X53, Splice
0.8 010EC Blk	X53, Splice
0.8 010ED Blk	X53, Splice
0.8 010EE Blk	Y09, Splice
0.8 010EF Blk	X53, Splice
0.8 010EG Blk	Y10, Splice
0.8 010EH Blk	X53, Splice
1.0 010EJ Blk	X04, Splice
0.8 010EM Blk	X80, Splice
1.0 202A Red	T28, Splice
1.0 202B Red	T28, SP_1 (option)
1.0 202C Red	X53, Splice
1.0 202D Red	X53, Splice
0.8 222A Red	X53, Splice
0.8 222B Red	X53, Splice
0.8 222C Red	S53, Splice
0.8 222E Red	S55, Splice
0.8 222F Red	S56, Splice
1.0 252 Red	X04, X53
0.8 764A Yel	X53, Splice
0.8 764B Yel	X53, Splice
0.8 764C Yel	X53, Splice
0.8 778A Gry	S53, X53
0.8 778B Gry	S53, S53
0.8 779A Wht	X78, X53
0.8 779B Wht	X53, Splice
0.8 779C Wht	X53, Splice
0.8 779D Wht	X78, Splice
0.8 779E Wht	S53, Splice
0.8 781 Brn	X78, X53
0.8 782 Red	X78, X53
0.8 783A Org	X53, Splice
0.8 783B Org	X53, Splice
0.8 783C Org	X53, Splice
0.8 785 Grn	Y09, X53
0.8 786 Blu	Y10, X53
0.8 787A Pur	S55, X80
0.8 788A Gry	S56, X80
0.8 789A Wht	S55, X80
0.8 791A Brn	S56, X80

OUO1082,0003604 -19-09MAR12-1/1

W28 3rd, 4th and 5th Function Wiring Harness (SN 710001—)



S53— EH Controls Enable Switch
S55— 4th SCV Switch
S56— 5th SCV Switch

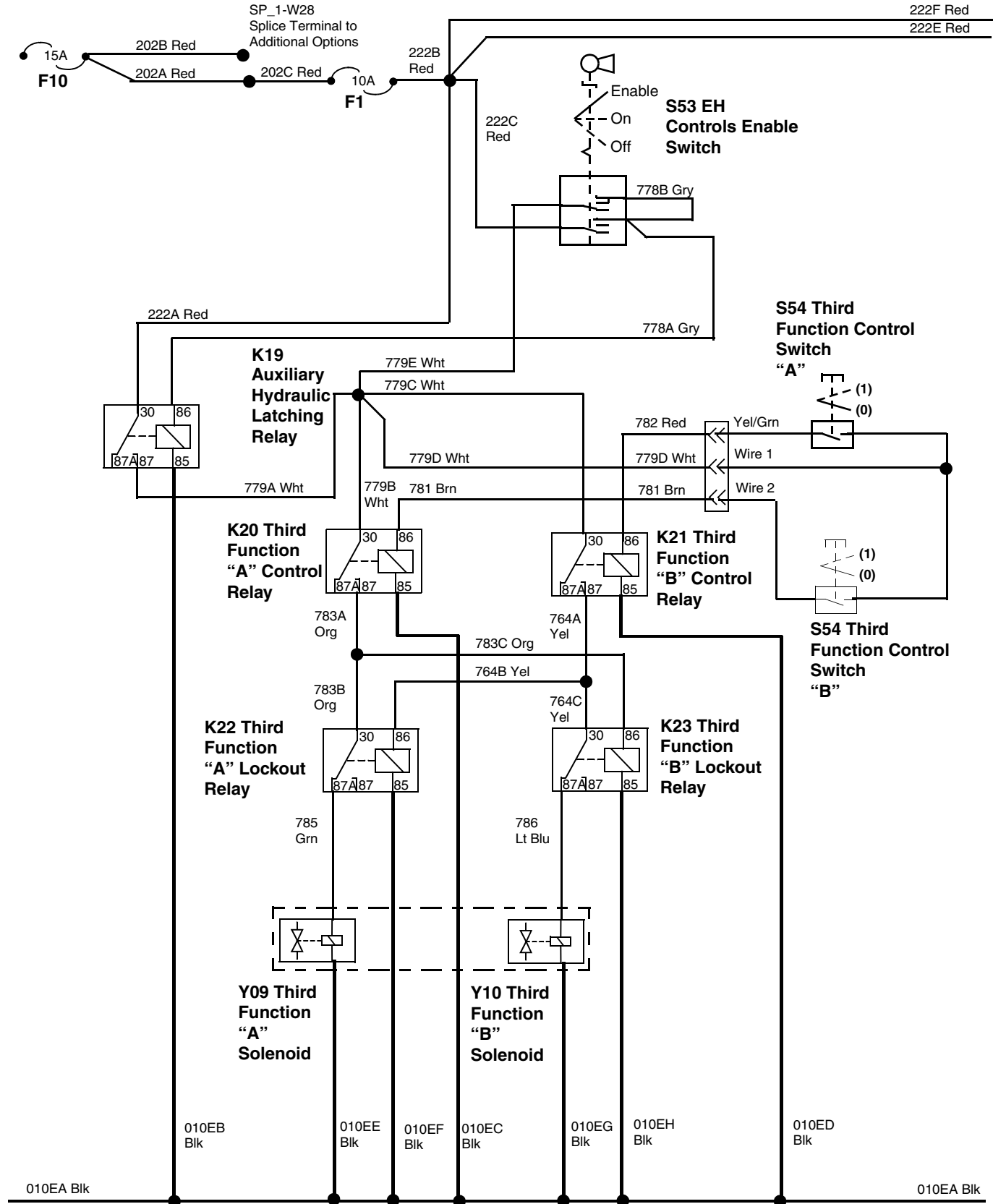
SP 1— Optional Power Connector
T28— Power Connector
T29— Ground Connector

X04— Power Port
X53— Load Center
X78— EH Handle Harness
X80— 4th and 5th Interconnect

Y09— A Solenoid
Y10— B Solenoid

OUC1082,0003605 -19-03JAN13-1/1

W28 3rd, 4th and 5th Function Wiring Schematic (SN 710001—)



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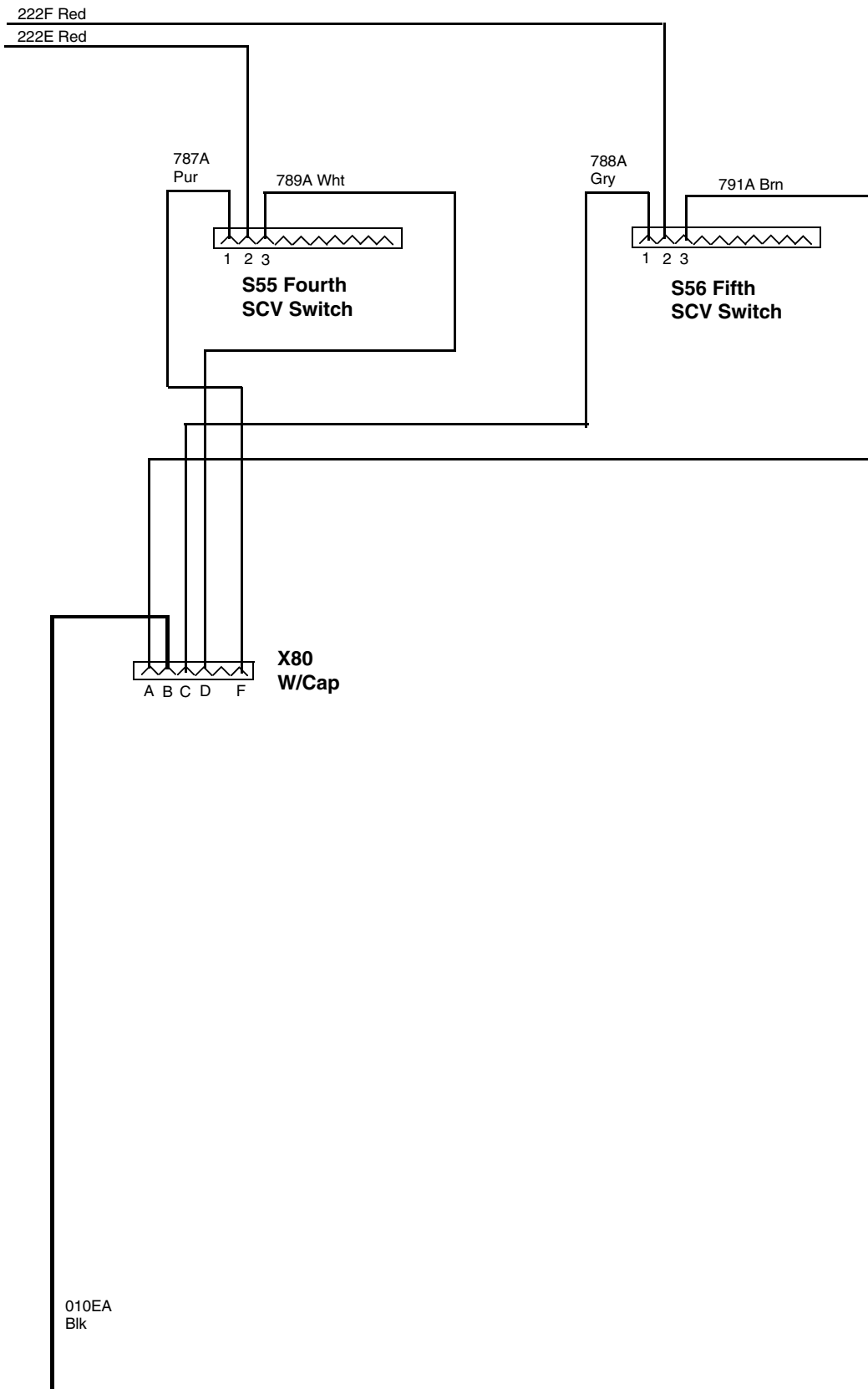
OUO1082,0003606 -19-03JAN13-1/3

Schematics and Harnesses

F1— 10A Fuse	K21— Third Function B Control Relay	S53— EH Controls Enable Switch	Y09— Third Function A Solenoid
F10— 15A Fuse		S54— Third Function Control Switch A	Y10— Third Function B Solenoid
K19— Auxiliary Hydraulic Latching Relay	K22— Third Function A Lockout Relay	S54— Third Function Control Switch B	
K20— Third Function A Control Relay	K23— Third Function B Lockout Relay		

Continued on next page

OUO1082,0003606 -19-03JAN13-2/3



S55— Fourth Function SCV Switch

S56— Fifth Function SCV Switch

X80— Connector (capped)

OUO1082,0003606 -19-03JAN13-3/3

LVAL16696 —UN—19APR11

Main Schematic and Wiring Harness Legend—PRT, eHydro™, and Auto HST

Domestic Model 2008 Serial Number Breaks

Model	Transmission	Serial Number
3120	eHydro™	410001-
3320	eHydro™	420001-
3320	PRT	427001-
3520	eHydro™	450001-
3520	PRT	460001-
3520	Auto HST	465001-
3720	eHydro™	480001-
3720	Auto HST	488001-

Schematic and Wiring Harness Legend

A1—Display Panel

B1—Air Filter Restriction Switch

B2—Engine Oil Pressure Switch

B3—Engine Coolant Temperature Sensor

B4—Fuel Gauge Sensor

E1—Left Headlight

E2—Right Headlight

E3—Right Work Light

E4—Left Work Light

E5—Right Turn/Hazard Light

E6—Left Turn/Hazard Light

E7—Right Tail Light

E8—Left Tail Light

F1—Fusible Link

F2—Fusible Link

F3—Fuse 30A

F4—Not Used

F5—Fuse 30A

F6—Not Used

F7—Fuse 20A

F8—Fuse 20A

F9—Fuse 20A

F10—Not Used

F11—Fuse 10A

G1—Battery

G2—Alternator

K1—Fuel Relay

K2—Start Relay

K3—Manifold Heater Relay

M1—Starting Motor

M2—Fuel Pump

R1—Manifold Heater

S1—Key Switch

S2—Light Switch

S3—Rear PTO Switch

S4—Display Mode Switch

S5—Turn Signal Switch

S6—Seat Switch

S7—MFWD Engagement Sensing Switch

S8—Park Brake Switch

S9—Mid PTO Sensing Switch (optional)

S10—Transmission Neutral Switch (PRT)

S11—Rear PTO Sensing Switch

S17—Brake Switch

S18—FNR Switch

W1—Battery/Frame Ground

Y1—Starting Motor Solenoid

Y2—Fuel Shutoff Solenoid

Y3—Rear PTO Solenoid

Connectors:

X1—W1 Main Wiring Harness-to-R1 Manifold Heater

X2—W1 Main Wiring Harness-to-Y2 Fuel Shutoff Solenoid

X3—W1 Main Wiring Harness-to-W2 Headlights Wiring Harness

X4—W1 Main Wiring Harness-to-W9 eHydro™/Auto HST Wiring Harness

X5—W1 Main Wiring Harness-to-W9 eHydro™/Auto HST Wiring Harness

X6—W1 Main Wiring Harness-to-A1 Display Panel

X7—W1 Main Wiring Harness-to-A1 Display Panel

X8—W1 Main Wiring Harness-to-W3 Jumper Plug (standard), S9 Mid PTO Switch (optional)

X9—W1 Main Wiring Harness-to-S10 Transmission Neutral Switch (PRT), W4 Jumper Plug (eHydro™/Auto HST)

X10—W1 Main Wiring Harness-to-A1 Display Panel

X11—W1 Main Wiring Harness-to-A1 Display Panel

Continued on next page

OUO1082,00030DB -19-08JAN13-1/2

X12—W1 Main Wiring Harness-to-E3 Right Work Light
 X13—W1 Main Wiring Harness-to-E3 Right Work Light
 X14—W1 Main Wiring Harness-to-E4 Left Work Light
 X15—W1 Main Wiring Harness-to-E4 Left Work Light
 X16—W1 Main Wiring Harness-to-E5 Right Turn/Hazard Light
 X17—W1 Main Wiring Harness-to-E7 Right Tail Light
 X18—W1 Main Wiring Harness-to-E5/E7 Right Turn/Hazard and Tail Light Ground
 X19—W1 Main Wiring Harness-to-E6 Left Turn/Hazard Light
 X20—W1 Main Wiring Harness-to-E8 Left Tail Light

eHydro is a trademark of Deere & Company

X21—W1 Main Wiring Harness-to-E6/E8 Left Turn/Hazard and Tail/Light Ground

Wiring Harnesses:

W1—Main Wiring Harness
 W2—Headlights Wiring Harness
 W3—Mid PTO Jumper Plug
 W4—Jumper Plug (eHydro™)
 W5—Right Work Light Wiring Harness (optional)
 W6—Left Work Light Wiring Harness (optional)
 W7—Right Rear Lights Wiring Harness
 W8—Left Rear Lights Wiring Harness

OUC1082,00030DB -19-08JAN13-2/2

W9 eHydro™/Auto HST—Schematic and Wiring Harness Legend

A2—Electronic Drive Controller
 H2—Backup Alarm
 S12—Load Match Switch (eHydro™)
 S13—Res/+, Set/- Switch (optional)
 S14—Cruise Control/Max Speed Switch (optional)
 S15—Motion Match Switch (optional)
 S16—Cruise Control Switch (standard)
 S18—FNR Switch (Auto HST)
 T1—Forward Pedal Sensor
 T2—Throttle Position Sensor
 T3—MFWD Speed Sensor
 T4—Reverse Pedal Sensor (eHydro)
 Y4—Reverse Proportional Solenoid
 Y5—Forward Proportional Solenoid

Connectors:

X26—W9 eHydro™ Wiring Harness to A2 Electronic Drive Controller

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X27—W9 eHydro™ Wiring Harness to W10 Proportional Valve Wiring Harness

X28—W9 eHydro™ Wiring Harness to W11 Cruise Control Wiring Harness (standard)

X28—W9 eHydro™ Wiring Harness to W12 Cruise Control Wiring Harness (optional)

X29—W9 eHydro™ Wiring Harness to T1 Forward Pedal Sensor

X30—W9 eHydro™ Wiring Harness to T2 Throttle Position Sensor

X31—W9 eHydro™ Wiring Harness to T3 MFWD Speed Sensor

X32—W9 eHydro™ Wiring Harness to T4 Reverse Pedal Sensor (sensor installed on eHydro)

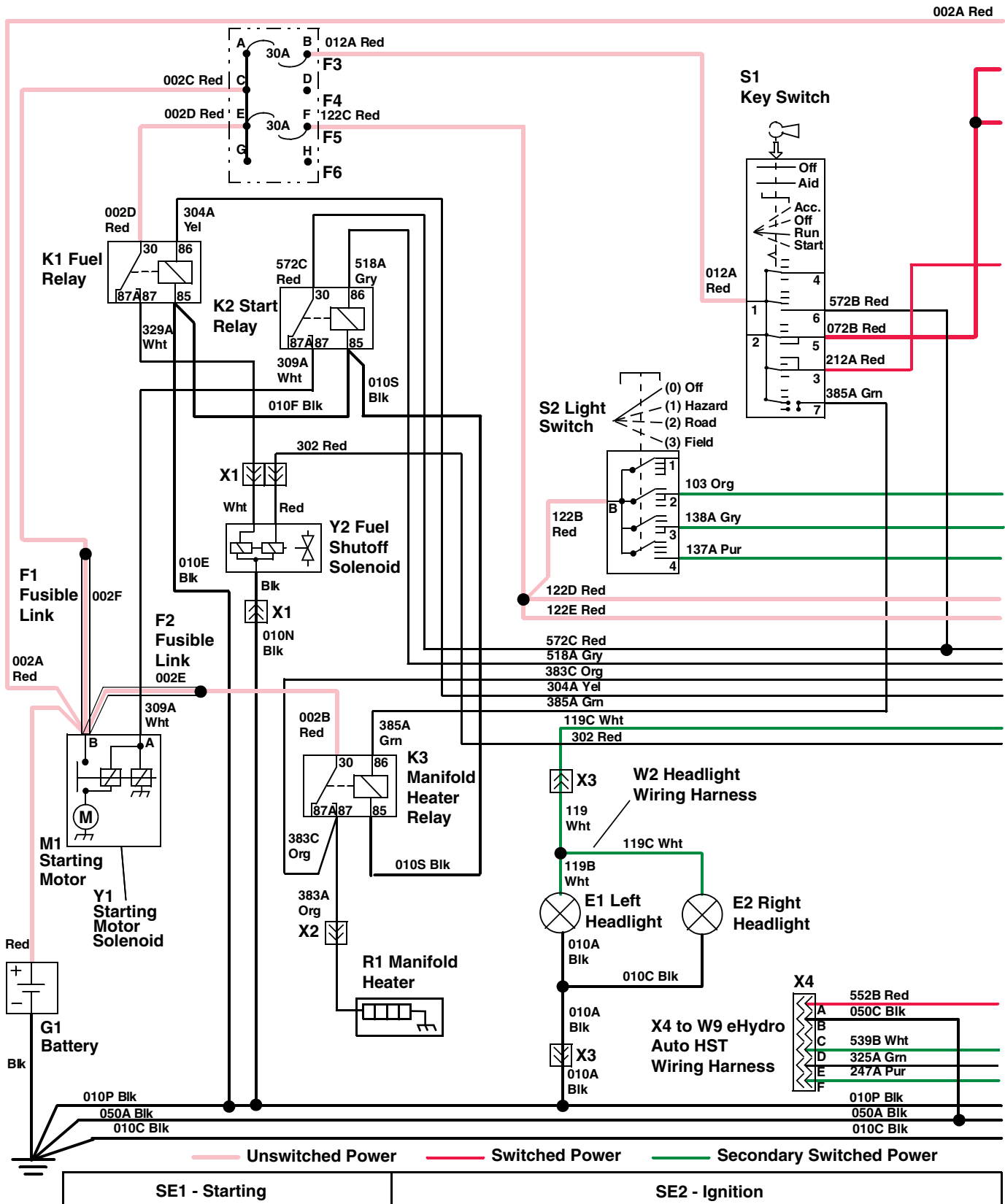
Wiring Harnesses:

W9—eHydro™ Wiring Harness (to MY2007)
 W9—eHydro™ and Auto HST Wiring Harness (MY2008)
 W10—Proportional Valve Wiring Harness
 W11—Cruise Control Wiring Harness (standard)
 W12—Cruise Control Wiring Harness (optional)

OUC1082,00030DC -19-03JAN13-1/1

W1 Main Wiring Schematic—MY08

W1 Main Wiring Schematic—MY08 (1 of 4)



LVAL11550—UN—02NOV10

Continued on next page

OUO1082,00030DD -19-15JAN13-1/8

E1—Left Headlight	K2—Start Relay	X1—W1 Main Wiring	X4—W1 Main Wiring Harness-
E2—Right Headlight	K3—Manifold Heater Relay	Harness-to-R1 Manifold	to-W9 eHydro™/Auto HST
F1—Fusible Link	M1—Starting Motor	Heater	Wiring Harness
F2—Fusible Link	R1—Manifold Heater	X2—W1 Main Wiring	
F3—Fuse 30A	S1—Key Switch	Harness-to-Y2 Fuel Shutoff	
F4—Not Used	S2—Light Switch	Solenoid	
F5—Fuse 30A	SE1—Starting	X3—W1 Main Wiring	
F6—Not Used	SE2—Ignition	Harness-to-W2 Headlight	
G1—Battery	W2—Headlights Wiring Harness	Wiring Harness	
K1—Fuel Relay			

eHydro is a trademark of Deere & Company

Continued on next page

OUC1082,00030DD -19-15JAN13-2/8

40-25-5



LVAL11551 —UN—02NOV10

B1—Air Filter Restriction Switch
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A

F10— Not Used
F11— Fuse 10A
M2—Fuel Pump
S3— Rear PTO Switch

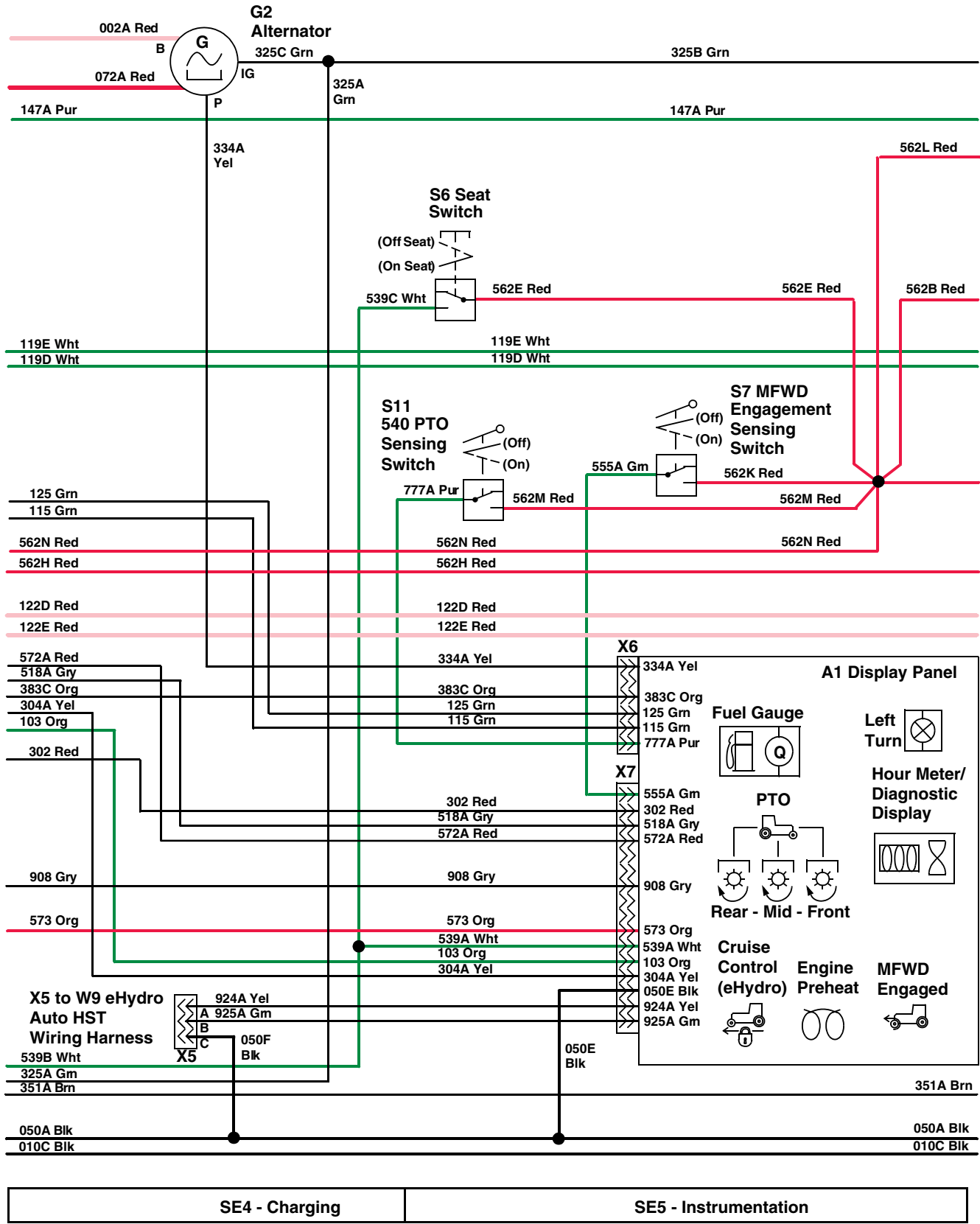
S4— Display Mode Switch
S5— Turn Signal Switch
S15— Brake Switch (S17)

SE3— Ignition
Y3—Rear PTO Solenoid

Continued on next page

OUO1082,00030DD -19-15JAN13-4/8

W1 Main Wiring Schematic—MY08 (3 of 4)



LVAL11552—UN—02NOV10

Continued on next page

OUO1082,00030DD -19-15JAN13-5/8

A1—Display Panel

G2—Alternator

S6—Seat Switch

S7—MFWD Engagement Sensing
Switch

S11— Rear PTO Sensing Switch

SE4— Charging

SE5— Instrumentation

X5— W1 Main Wiring

Harness-to-W9 eHydro™
Wiring Harness

X6— W1 Main Wiring

Harness-to-A1 Display Panel

X7— W1 Main Wiring

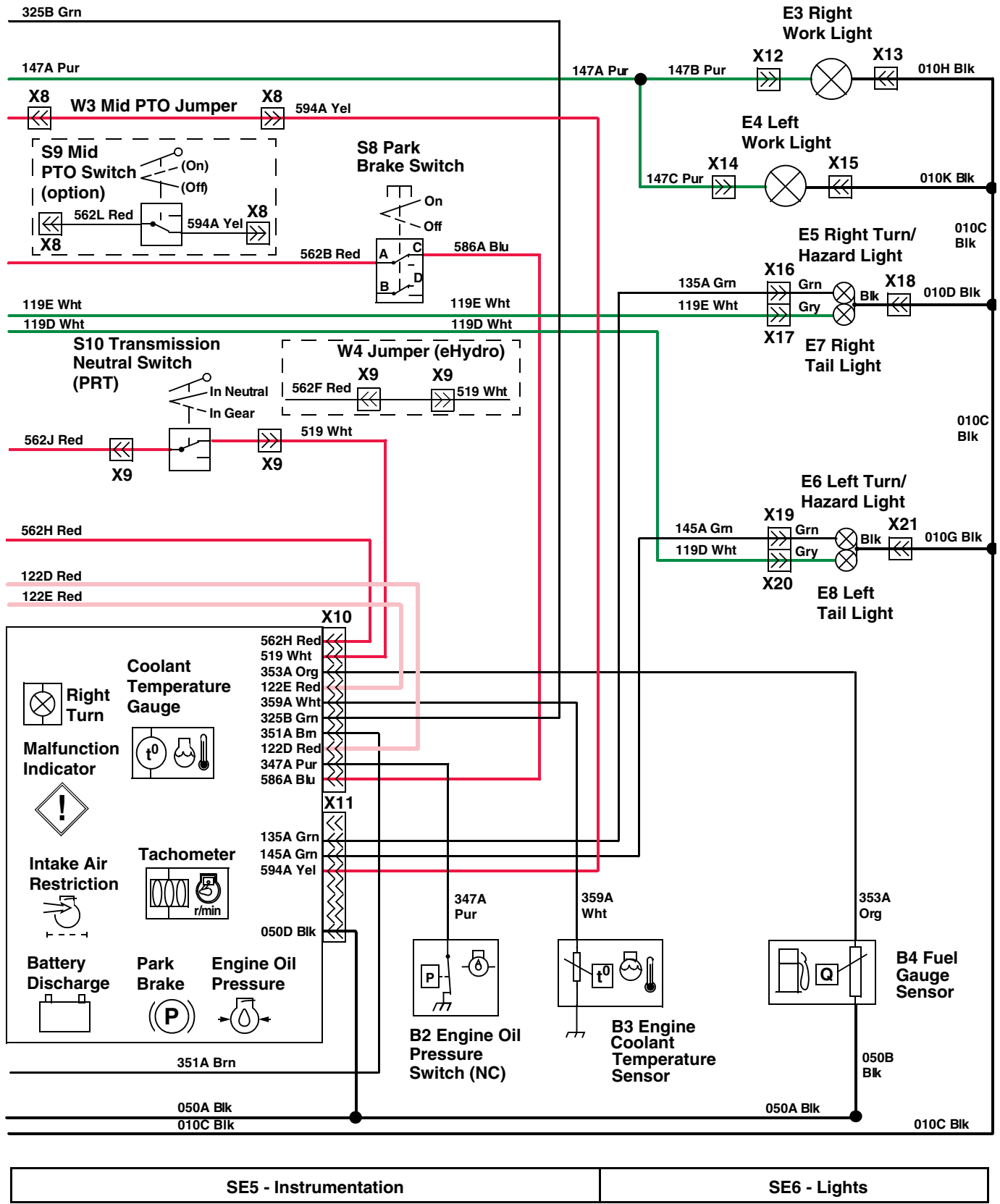
Harness-to-A1 Display Panel

eHydro is a trademark of Deere & Company

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OUC1082,00030DD -19-15JAN13-6/8

W1 Main Wiring Schematic—MY08 (4 of 4)



LVAL11563—UN—02NOV10

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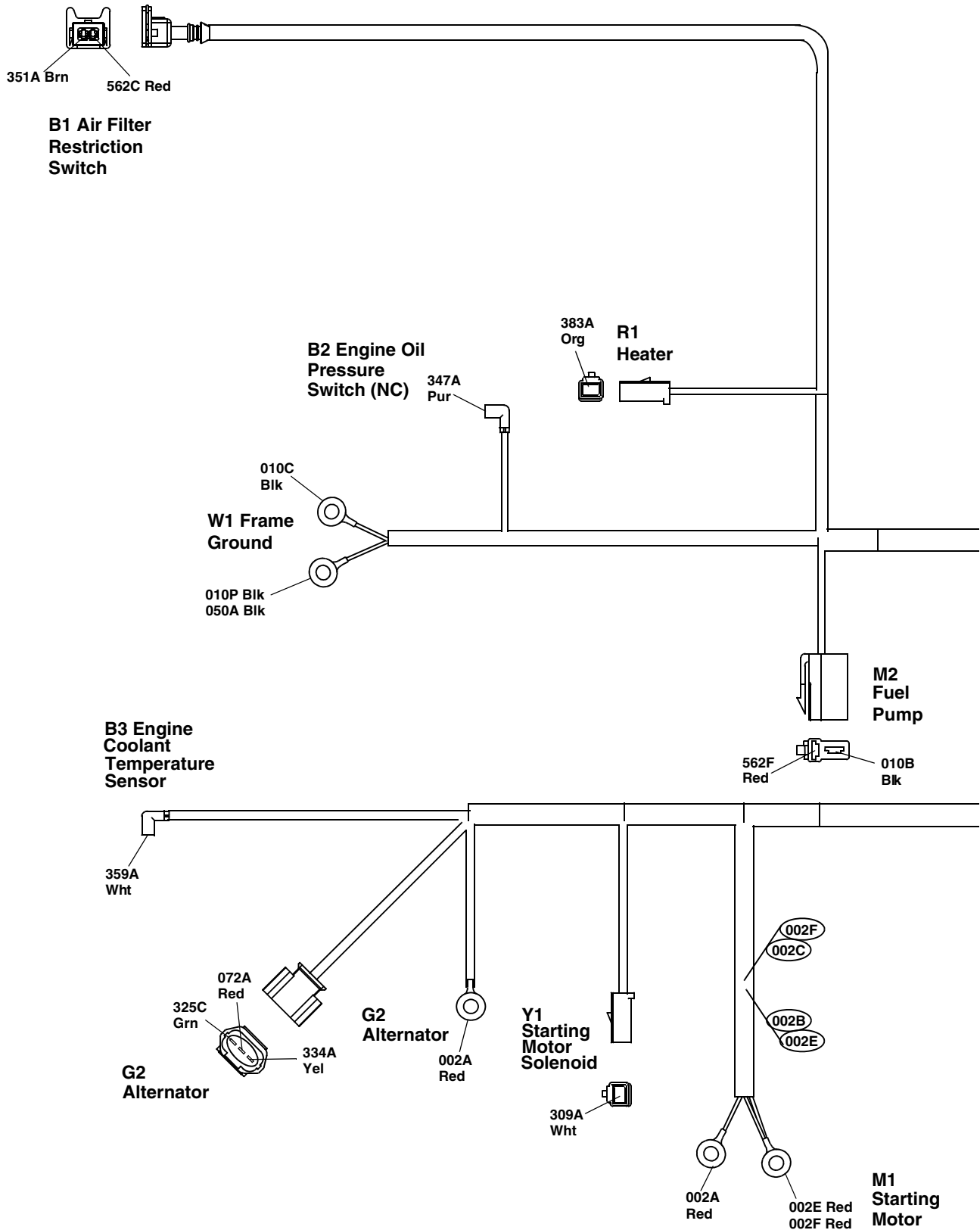
OUO1082,00030DD -19-15JAN13-7/8

B2—Engine Oil Pressure Switch	SE5— Instrumentation	X12— W1 Main Wiring	X19— W1 Main Wiring
B3—Engine Coolant Temperature Sensor	SE6— Lights	Harness-to-E3 Right Work Light	Harness-to-E6 Left Turn/Hazard Light
B4—Fuel Gauge Sensor	X8— W1 Main Wiring	X13— W1 Main Wiring	X20— W1 Main Wiring
E3—Right Work Light	Harness-to-W3 Jumper	Harness-to-E3 Right Work Light	Harness-to-E8 Left Tail Light
E4—Left Work Light	Plug (standard), S9 Mid PTO Switch (optional)	X14— W1 Main Wiring	X21— W1 Main Wiring
E5—Right Turn/Hazard Light	X9— W1 Main Wiring	Harness-to-E4 Left Work Light	Harness-to-E6/E8 Left Turn/Hazard and Tail Light
E6—Left Turn/Hazard Light	Harness-to-S10	X15— W1 Main Wiring	Ground
E7—Right Tail Light	Transmission Neutral Switch (PRT), W4 Jumper	Harness-to-E4 Left Work Light	W3—Mid PTO Jumper Plug
E8—Left Tail Light	Plug (eHydro™)	X16— W1 Main Wiring	W4—Jumper Plug (eHydro™)
S8—Park Brake Switch	X10— W1 Main Wiring	Harness-to-E5 Right Turn/Hazard Light	
S9—Mid PTO Sensing Switch (optional)	Harness-to-Display Panel	X17— W1 Main Wiring	
S10— Transmission Neutral Switch (PRT)	X11— W1 Main Wiring	Harness-to-E7 Right Tail Light	
	Harness-to-Display Panel	X18— W1 Main Wiring	
		Harness-to-E5/E7 Right Turn/Hazard and Tail Light	
		Ground	

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OUC1082,00030DD -19-15JAN13-8/8

W1 Main Wiring Harness—MY08



LVAL11554 —UN—02NOV10

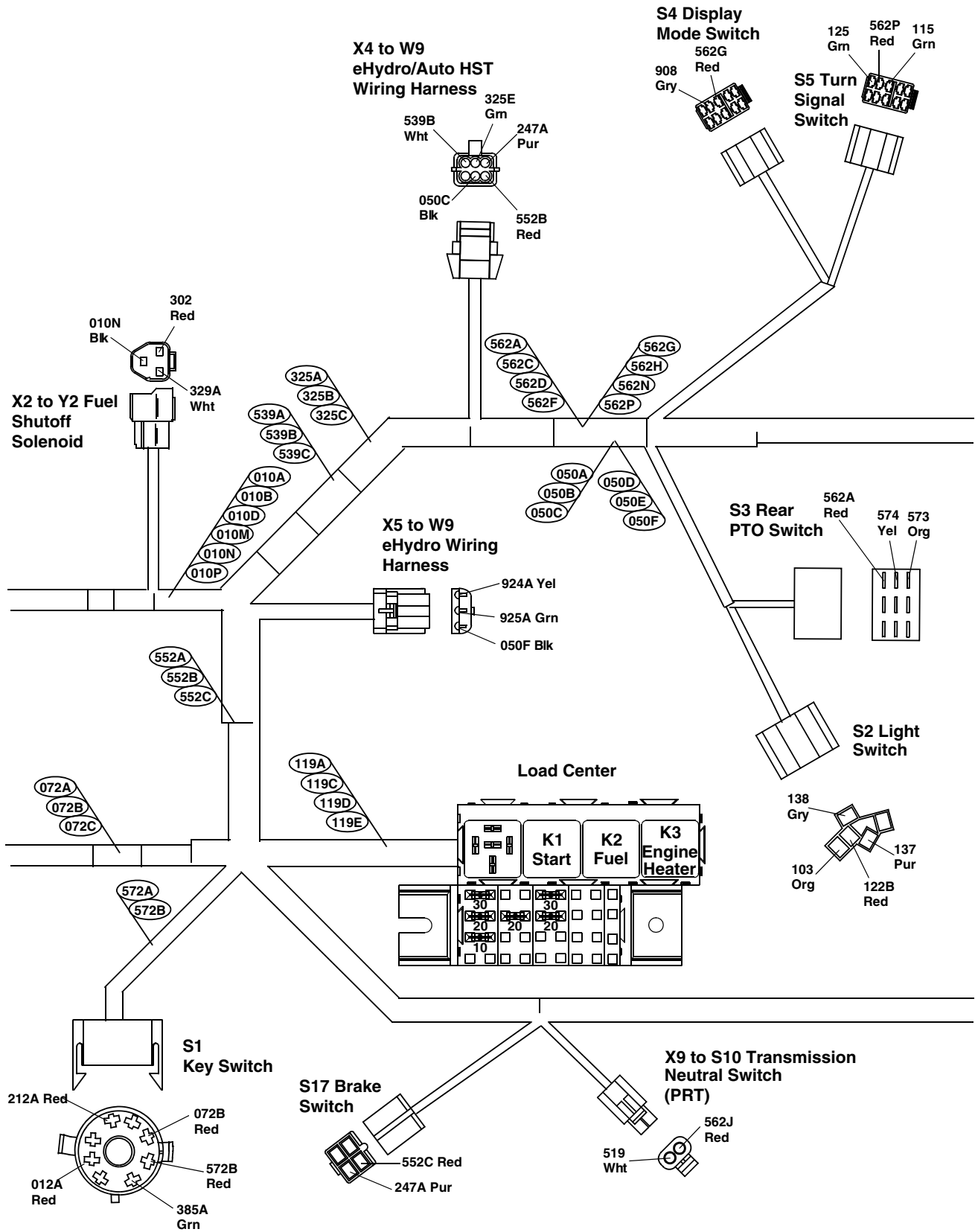
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OUO1082,00030DE -19-03JAN13-1/7

B1—Air Filter Restriction Switch	B3—Engine Coolant Temperature	M2—Fuel Pump	Y1—Starting Motor Solenoid
B2—Engine Oil Pressure Switch	Sensor	R1—Manifold Heater	
	G2—Alternator	W1—Battery/Frame Ground	
	M1—Starting Motor		

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OUO1082,00030DE -19-03JAN13-2/7



LVAL11555—UN—02NOV10

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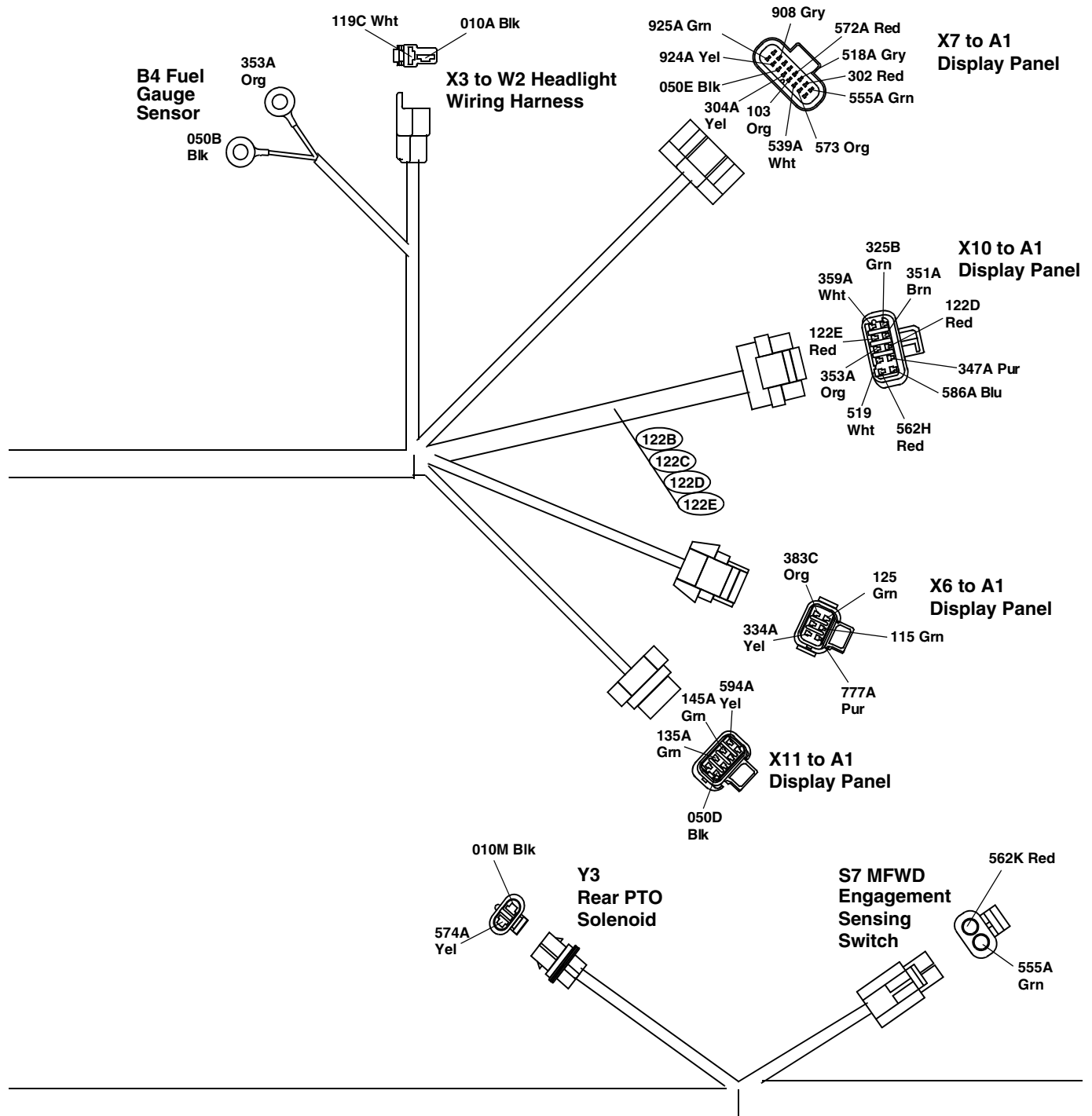
OUC1082,00030DE -19-03JAN13-3/7

K1—Fuel Relay	S5—Turn Signal Switch	X5—W1 Main Wiring
K2—Start Relay	S17— Brake Switch	Harness-to-W9 eHydro™
K3—Manifold Heater Relay	X2—W1 Main Wiring	Wiring Harness
S1—Key Switch	Harness-to-Y2 Fuel Shutoff	X9—W1 Main Wiring
S2—Light Switch	Solenoid	Harness-to-S10
S3—Rear PTO Switch	X4—W1 Main Wiring Harness-	Transmission Neutral
S4—Display Mode Switch	to-W9 eHydro™/Auto HST	Switch (PRT), W4 Jumper
	Wiring Harness	Plug (eHydro™/Auto HST)

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OUO1082,00030DE -19-03JAN13-4/7

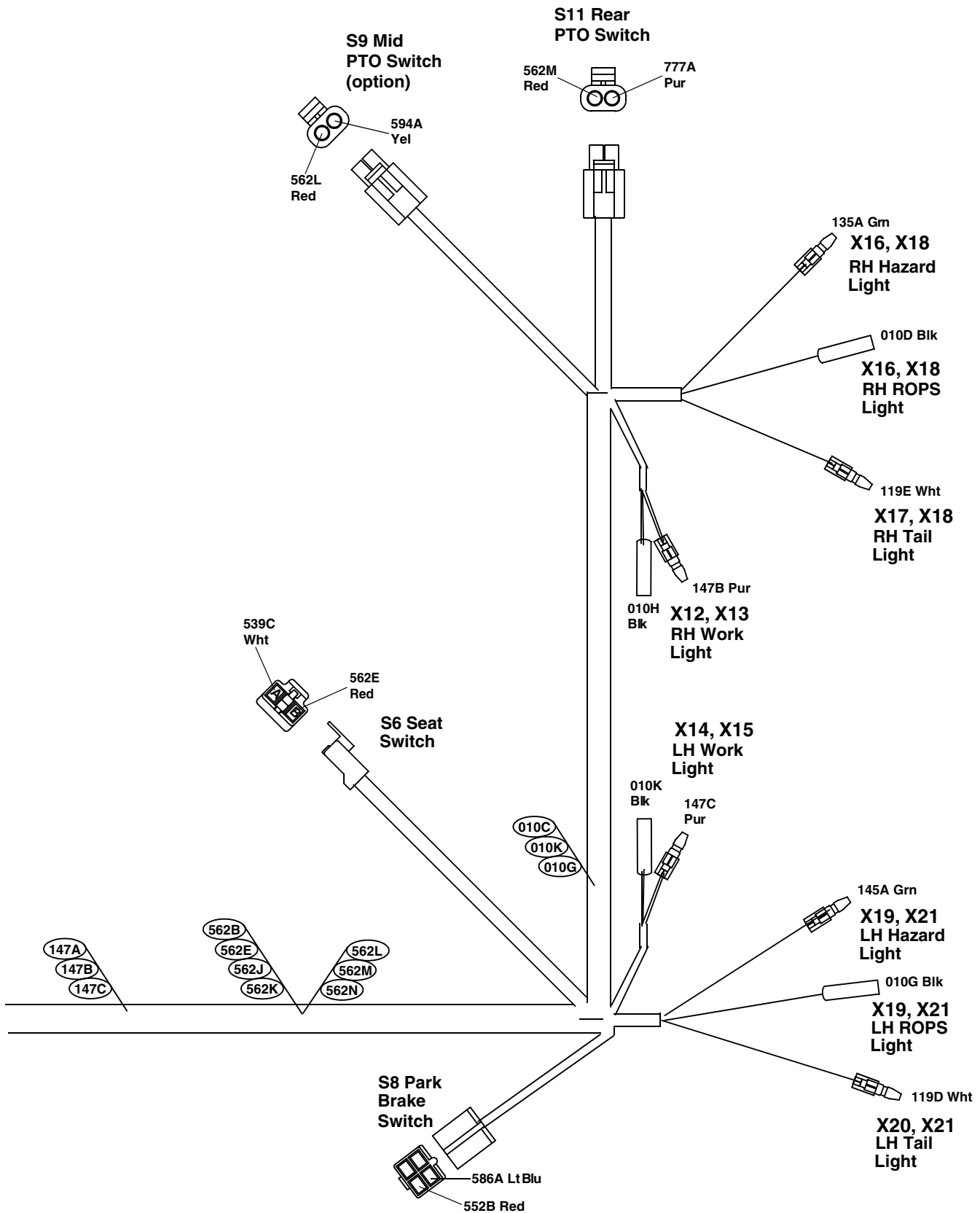


LVAL11556—UN—02NOV10

B4—Fuel Gauge Sensor
 S7—MFWD Engagement Sensing Switch
 X3—W1 Main Wiring Harness-to-W2 Headlight Wiring Harness
 X6—W1 Main Wiring Harness-to-A1 Display Panel
 X7—W1 Main Wiring Harness-to-A1 Display Panel
 X10—W1 Main Wiring Harness-to-A1 Display Panel
 X11—W1 Main Wiring Harness-to-A1 Display Panel
 Y3—Rear PTO Solenoid

Continued on next page

OUC1082,00030DE -19-03JAN13-5/7



LVAL11557 —UN—17DEC10

Continued on next page

OUC1082,00030DE -19-03JAN13-6/7

S6—Seat Switch	X14— W1 Main Wiring Harness-to-E4 Left Work Light	X18— W1 Main Wiring Harness-to- E5/E7 Right Tail/ROPS/Hazard Light	X21— W1 Main Wiring Harness-to-E6/E8 Left Tail/ROPS/Hazard Light
S8—Park Brake Switch			
S9—Mid PTO Switch (optional)			
S11— Rear PTO Sense Switch	X15— W1 Main Wiring Harness-to-E4 Left Work Light	X19— W1 Main Wiring Harness-to-E6 Left ROPS/Hazard Light	
X12— W1 Main Wiring Harness-to-E3 Right Work Light	X16— W1 Main Wiring Harness-to-E5 Right ROPS/Hazard Light	X20— W1 Main Wiring Harness-to-E8 Left Tail Light	
X13— W1 Main Wiring Harness-to-E3 Right Work Light	X17— W1 Main Wiring Harness-to-E7 Right Tail Light		

OUO1082,00030DE -19-03JAN13-7/7

W1 Main Wiring Harness Color Codes—MY08

Size/No./Color	Wire Connection Points
5.0 002A Red	Y1, G2
5.0 002B Red	F2 Fusible Link, K3
5.0 002C Red	F1 Fusible Link, Fuse Block
5.0 002D Red	Fuse Block, K1
2.0 002E Fuse Link	F2 Fusible Link—M1, 002B
2.0 002F Fuse Link	F1 Fusible Link—M1, 002C
1.0 010A Blk	X3, Splice
1.0 010B Blk	M2, Splice
3.0 010C Blk	Splice, W1
0.8 010D Blk	X18, Splice
0.8 010E Blk	K1, Splice
0.8 010F Blk	K1, K2
0.8 010G Blk	X21, Splice
1.0 010H Blk	X13, Splice
1.0 010K Blk	X15, Splice
0.8 010M Blk	Y3, Splice
3.0 010N Blk	X2, Splice
3.0 010P Blk	W1, Splice
0.8 010S Blk	K2, K3
3.0 012A Red	Fuse Block, S1
2.0 050A Blk	W1, Splice
0.8 050B Blk	Splice, B4
0.8 050C Blk	X4, Splice
0.8 050D Blk	X11, Splice
0.8 050E Blk	X7, Splice
0.8050F Blk	Splice, X5
1.0 072A Red	Splice, G2
1.0 072B Red	S1, Splice
1.0 072C Red	Splice, Fuse Block
0.8 103 Org	S2, X7
0.8 115 Grn	S5, X6
1.0 119A Wht	Fuse Block, Splice
1.0 119C Wht	Splice, X3
0.8 119D Wht	Splice, X20
0.8 119E Wht	Splice, X17
3.0 122B Red	Splice, S2
3.0 122C Red	Fuse Block, Splice
1.0 122D Red	Splice, X10
1.0 122E Red	Splice, X10
0.8 125 Grn	S5, X6
0.8 135A Grn	X11, X16
1.0 137A Pur	S2, Fuse Block
2.0 138A Gry	S2, Fuse Block
0.8 145A Grn	X11, X19
2.0 147A Pur	Fuse Block, Splice
1.0 147B Pur	Splice, X12
1.0 147C Pur	Splice, X14
1.0 212A Red	S1, Fuse Block
0.8 247A Pur	X4, S17
1.0 302 Red	X2, X7

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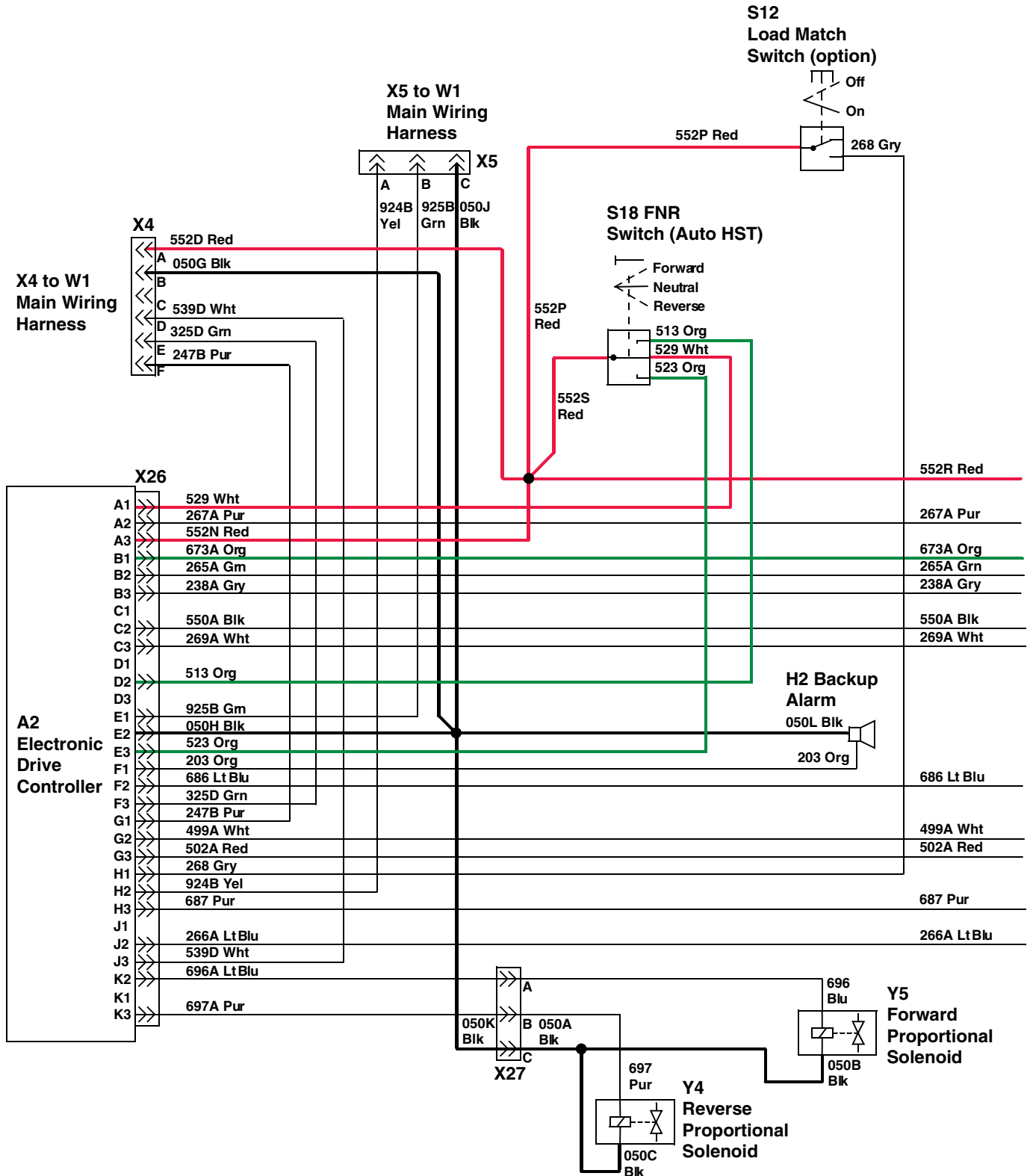
OUO1082,00030DF -19-28FEB12-1/2

Size/No./Color	Wire Connection Points
0.8 304A Yel	K1, X7
2.0 309A Wht	Y1, K2
0.8 325A Grn	X4, Splice
0.8 325B Grn	Splice, X10
1.0 325C Grn	Splice, G2
3.0 329A Wht	K1, X2
1.0 334A Yel	G2, X6
0.8 347A Pur	X10, B2
0.8 351A Brn	B1, X10
0.8 353A Org	X10, B4
0.8 359A Wht	X10, B3
3.0 383A Org	K3, X1
0.8 383C Org	K3, X6
0.8 385A Grn	S1, K3
0.8 518A Gry	K2, X7
0.8 519 Wht	X9, X10
0.8 539A Wht	X7, Splice
0.8 539B Wht	X4, Splice
0.8 539C Wht	Splice, S6
0.8 552A Red	Fuse Block, Splice
0.8 552B Red	Splice, X4
0.8 552C Red	Splice, S17
0.8 555A Grn	S7, X7
0.8 562A Red	Splice, S3
0.8 562B Red	Splice, S8
0.8 562C Red	Splice, B1
1.0 562D Red	Fuse Block, Splice
0.8 562E Red	S6, Splice
1.0 562F Red	Splice, M2
0.8 562G Red	Splice, S4
0.8 562H Red	Splice, X10
0.8 562J Red	Splice, S10
0.8 562K Red	S7, Splice
0.8 562L Red	Splice, X8
0.8 562M Red	S11, Splice
0.8 562N Red	Splice, Splice
0.8 562P Red	Splice, S5
0.8 572A Red	Splice, X7
1.0 572B Red	S1, Splice
1.0 572C Red	K2, Splice
0.8 573 Org	S3, X7
0.8 574A Yel	S3, Y3
0.8 586A Lt Blu	S8, X10
0.8 594A Yel	X8, X11
0.8 777A Pur	S11, X6
0.8 908 Gry	S4, X7
0.8 924A Yel	X5, X7
0.8 925A Grn	X5, X7

OUO1082,00030DF -19-28FEB12-2/2

W9 eHydro™/Auto HST and Cruise Control Electrical Schematic—MY08

W9 eHydro™/Auto HST Schematic—MY08 (1 of 2)



LVAL11558—UN—02NOV10

Continued on next page

OUO1082,00030E0 -19-15JAN13-1/4

A2—Electronic Drive Controller
H2—Backup Alarm
S12— Load Match Switch
(eHydro™)

S18— FNR Switch (Auto HST)
X4— W1 Main Wiring Harness-
to-W9 eHydro™/Auto HST
Wiring Harness
X5— W1 Main Wiring
Harness-to-W9 eHydro™
Wiring Harness

X26— W9 eHydro™ Wiring
Harness-to-A2 Electronic
Drive Controller
X27— W9 eHydro™ Wiring
Harness-to-W10
Proportional Valve Wiring
Harness

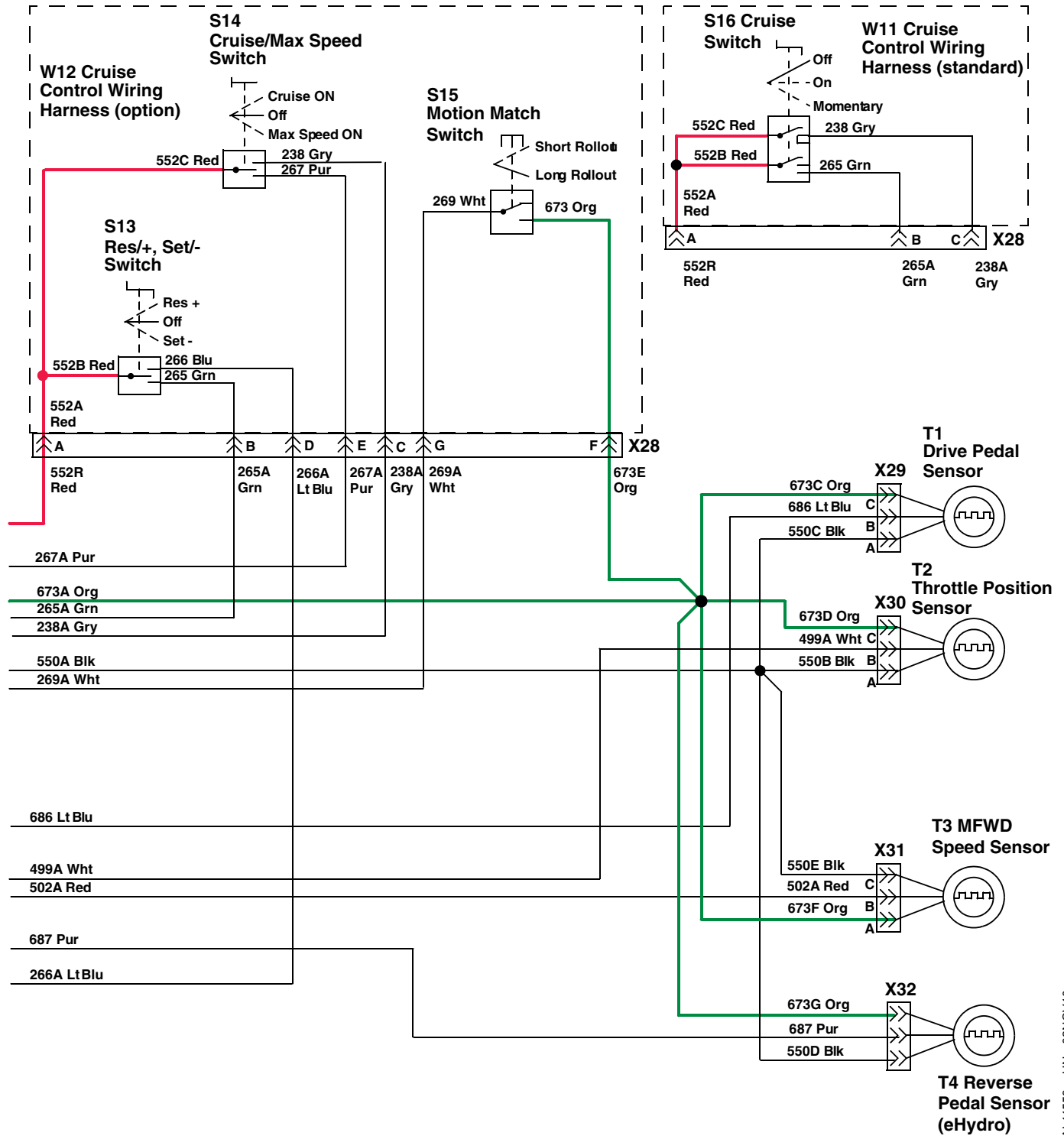
Y4—Reverse Proportional
Solenoid
Y5—Forward Proportional
Solenoid

eHydro is a trademark of Deere & Company

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OUO1082,00030E0 -19-15JAN13-2/4

W9 eHydro™/Auto HST Schematic—MY08 (2 of 2)



LVAL11559—UN—02NOV10

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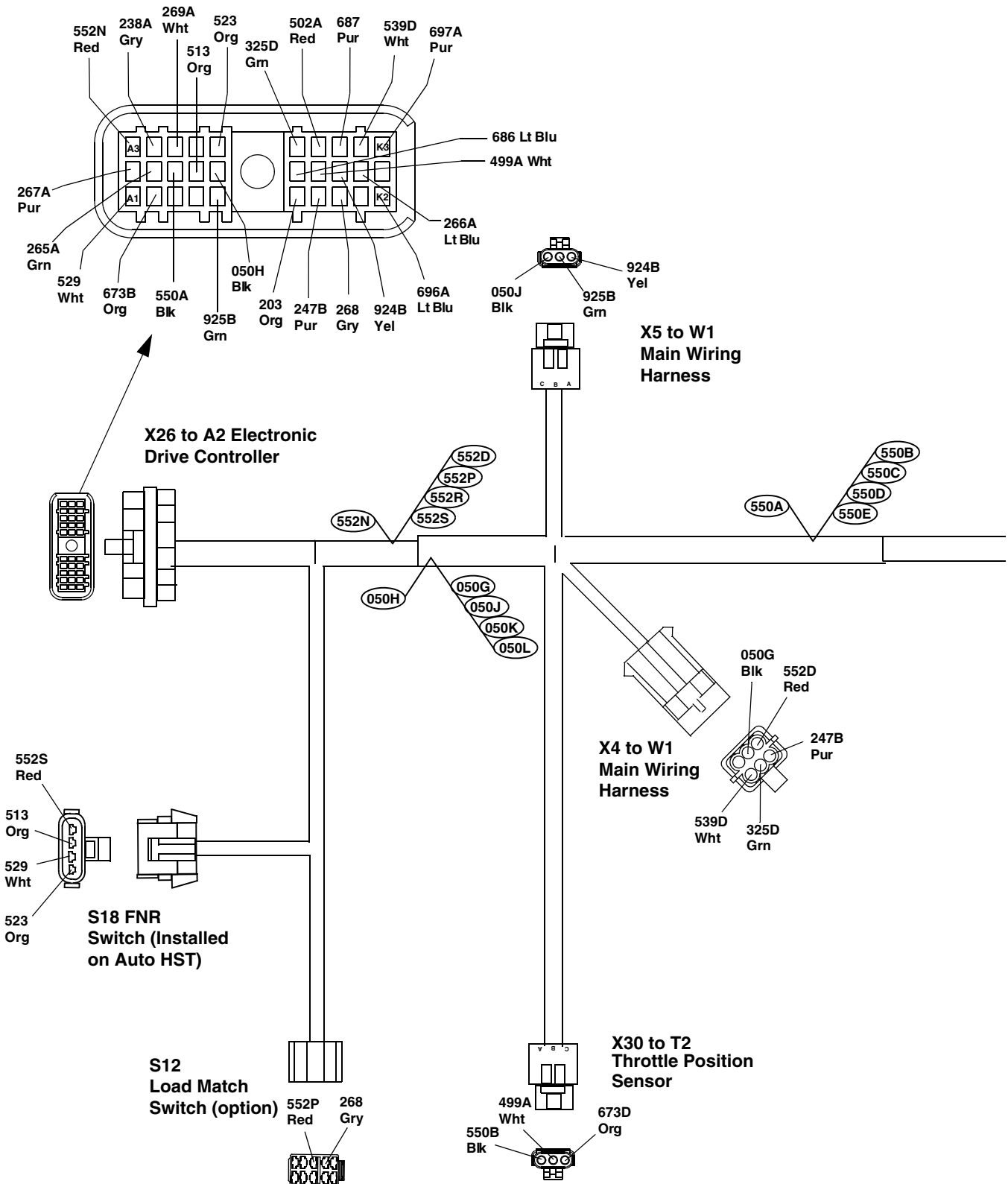
OUO1082,00030E0 -19-15JAN13-3/4

S13— Res/+, Set/- Switch (optional)	T3— MFWD Speed Sensor	X28— W9 eHydro™ Wiring Harness-to-W12 Cruise Control Wiring Harness (optional)	X32— W9 eHydro™ Wiring Harness-to-T4 Reverse Pedal Sensor (eHydro™ only)
S14— Cruise Control/Max Speed Switch (optional)	T4— Reverse Pedal Sensor (eHydro™)		
S15— Motion Match Switch (optional)	W11— Cruise Control Wiring Harness (standard)	X29— W9 eHydro™ Wiring Harness-to-T1 Forward Pedal Sensor	
S16— Cruise Control Switch (standard)	W12— Cruise Control Wiring Harness (optional)	X30— W9 eHydro™ Wiring Harness-to-T2 Throttle Position Sensor	
T1— Forward Pedal Sensor	X28— W9 eHydro™ Wiring Harness-to-W11 Cruise Control Wiring Harness (standard)	X31— W9 eHydro™ Wiring Harness-to-T3 MFWD Speed Sensor	
T2— Throttle Position Sensor			

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OUO1082,00030E0 -19-15JAN13-4/4

W9 eHydro™/Auto HST Wiring Harness—MY08



LVAL11560 —UN—02NOV10

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OUO1082,00030E1 -19-03JAN13-1/4

S12— Load Match Switch
(eHydro™)
S18— FNR Switch (Auto HST)

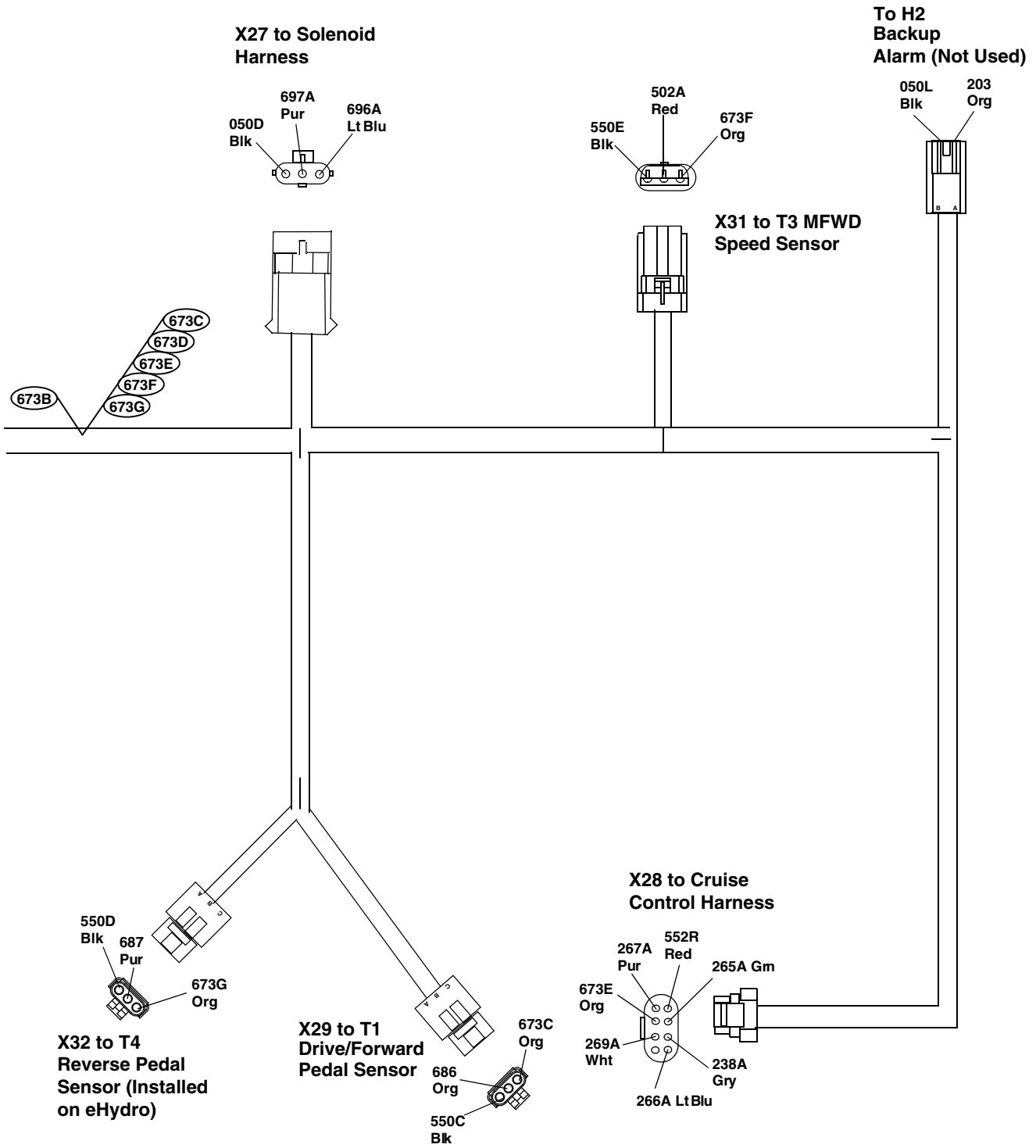
X4— W1 Main Wiring
Harness-to-W9 eHydro™
Wiring Harness
X5— W1 Main Wiring
Harness-to-W9 eHydro™
Wiring Harness

X26— W9 eHydro™ Wiring
Harness-to-A2 Electronic
Drive Controller
X30— W9 eHydro™ Wiring
Harness-to-T2 Throttle
Position Sensor

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OUC1082,00030E1 -19-03JAN13-2/4



LVAL11561—UN—02NOV10

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OOU01082,00030E1 -19-03JAN13-3/4

H2—Backup Alarm (not used)	X28— W9 eHydro™ Wiring Harness-to- W12 Cruise Control Wiring Harness (optional)	X31— W9 eHydro™/ Wiring Harness-to-T3 MFWD Speed Sensor
X27— W9 eHydro™ Wiring Harness-to-W10 Proportional Valve Wiring Harness	X29— W9 eHydro™ Wiring Harness-to-T1 Forward Pedal Sensor	X32— W9 eHydro™/ Wiring Harness-to-T4 Reverse Pedal Sensor (sensor installed on eHydro)™

eHydro is a trademark of Deere & Company

OUO1082,00030E1 -19-03JAN13-4/4

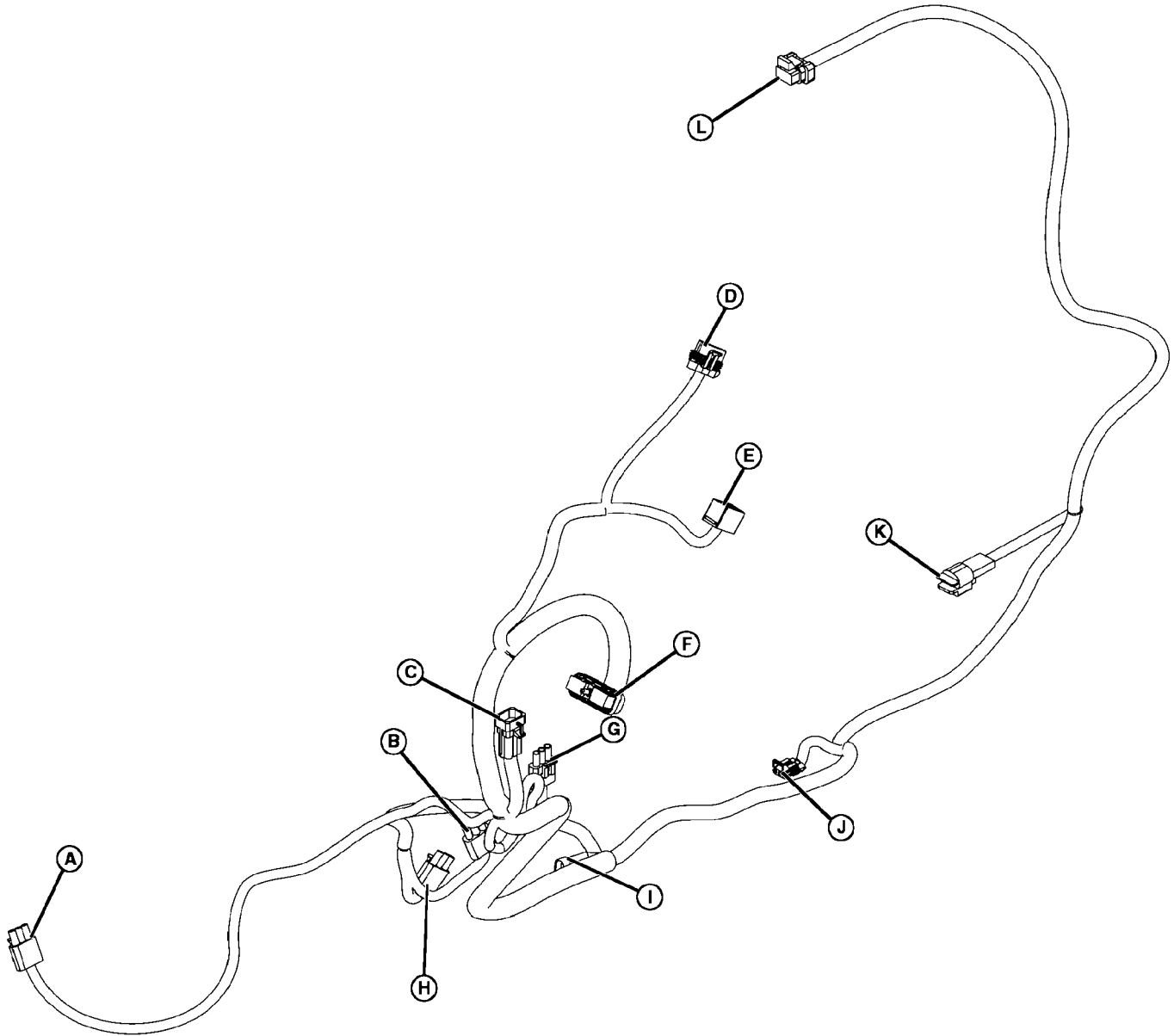
W9 eHydro™/Auto HST Wiring Harness

Color Codes—MY08

Size/No./Color	Wire Connection Points
0.8 050G Blk	Splice 050, X4
0.8 050H Blk	X26, Splice 050
0.8 050J Blk	Splice 050, X5
0.8 050K Blk	Splice 050, X27
0.8 050L Blk	Splice 050, H2
0.8 203 Org	X26, H2
0.8 238A Gry	X26, X28
0.8 247B Pur	X26, X4
0.8 265A Grn	X26, X28
0.8 266A Lt Blu	X26, X28
0.8 267A Pur	X26, X28
0.8 268 Gry	X26, S12
0.8 269A Wht	X26, X28
0.8 325D Grn	X26, X4
0.8 499A Wht	X26, T2
0.8 502A Red	X26, T3
0.8 513 Org	X26, S18
0.8 523 Org	X26, S18
0.8 529 Wht	X26, S18
0.8 539D Wht	X4, X26
0.8 550A Blk	X26, Splice 550
0.8 550B Blk	Splice 550, T2
0.8 550C Blk	Splice 550, T1
0.8 550D Blk	Splice 550, T4
0.8 550E Blk	Splice 550, T3
0.8 552D Red	Splice 552, X4
0.8 552N Red	X26, Splice 552
0.8 552P Red	Splice 552, S12
0.8 552R Red	Splice 552, X28
0.8 552S Red	Splice 552, S18
0.8 673B Org	X26, Splice 673
0.8 673C Org	Splice 673, T1
0.8 673D Org	Splice 673, T2
0.8 673E Org	Splice 673, X28
0.8 673F Org	Splice 673, T3
0.8 673G Org	Splice 673, T4
0.8 686 Lt Blu	X26, T1
0.8 687 Pur	X26, T4
0.8 696A Lt Blu	X26, X27
0.8 697A Pur	X26, X27
0.8 924B Yel	X26, X5
0.8 925B Grn	X26, X5

OUO1082,00030E2 -19-28FEB12-1/1

W9 eHydro™/Auto HST Wiring Harness—MY08



Left Front View

- | | | | |
|---|--|---|--|
| A—T2 Throttle Position Sensor | D—S18 FNR Switch (Auto HST) | H—X5 W1 Main Wiring Harness-to-W9 eHydro™ Wiring Harness Connector | K—H2 Backup Alarm |
| B—T1 Forward Pedal Sensor | E—S12 Load Match Switch | I—X27 eHydro™ Wiring Harness-to-W10 Proportional Valve Wiring Harness Connector | L—X28 eHydro™ Wiring Harness-to-W11 or W12 Cruise Control Wiring Harness Connector |
| C—X4 W1 Main Wiring Harness-to-W9 eHydro™/Auto HST Wiring Harness Connector | F—X26 eHydro™ Wiring Harness-to-A2 Electronic Drive Controller Connector | J—T3 MFWD Speed Sensor | |
| | G—T4 Reverse Pedal Sensor | | |

eHydro is a trademark of Deere & Company

OUO1082,00030E3 -19-03JAN13-1/1

LVAL11562 —UN—02NOV10

Main Schematic and Wiring Harness Legend—PRT, eHydro™, and Auto HST

Schematic and Wiring Harness Legend

A1—Display Panel	S4—Display Mode Switch
B1—Air Filter Restriction Switch	S5—Turn Signal Switch
B2—Engine Oil Pressure Switch	S6—Seat Switch
B3—Engine Coolant Temperature Sensor	S7—MFWD Engagement Sensing Switch
B4—Fuel Gauge Sensor	S8—Park Brake Switch
E1—Left Headlight	S9—Mid PTO Sensing Switch (optional)
E2—Right Headlight	S10—Transmission Neutral Switch (PRT)
E3—Right Work Light	S11—Rear PTO Sensing Switch
E4—Left Work Light	S17—Brake Switch
E5—Right Turn/Hazard Light	W1—Battery/Frame Ground
E6—Left Turn/Hazard Light	Y1—Starting Motor Solenoid
E7—Right Tail Light	Y2—Fuel Shutoff Solenoid
E8—Left Tail Light	Y3—Rear PTO Solenoid
F1—Fusible Link	X57—Front Implement Detection
F2—Fusible Link	Connectors:
F3—Fuse 30A	X1—W1 Main Wiring Harness-to-R1 Manifold Heater
F4—Not Used	X2—W1 Main Wiring Harness-to-Y2 Fuel Shutoff Solenoid
F5—Fuse 30A	X3—W1 Main Wiring Harness-to-W2 Headlights Wiring Harness
F6—Not Used	X4—W1 Main Wiring Harness-to-W9 eHydro™/Auto HST Wiring Harness
F7—Fuse 20A	X5—W1 Main Wiring Harness-to-W9 eHydro™/Auto HST Wiring Harness
F8—Fuse 20A	X6—W1 Main Wiring Harness-to-A1 Display Panel
F9—Fuse 20A	X7—W1 Main Wiring Harness-to-A1 Display Panel
F10—Not Used	X8—W1 Main Wiring Harness-to-W3 Jumper Plug (standard), S9 Mid PTO Sensing Switch (optional)
F11—Fuse 10A	X9—W1 Main Wiring Harness-to-S10 Transmission Neutral Switch (PRT), W4 Jumper Plug (eHydro™/Auto HST)
G1—Battery	X10—W1 Main Wiring Harness-to-A1 Display Panel
G2—Alternator	X11—W1 Main Wiring Harness-to-A1 Display Panel
K1—Fuel Relay	X12—W1 Main Wiring Harness-to-E3 Right Work Light
K2—Start Relay	X13—W1 Main Wiring Harness-to-E3 Right Work Light
K3—Manifold Heater Relay	X14—W1 Main Wiring Harness-to-E4 Left Work Light
M1—Starting Motor	X15—W1 Main Wiring Harness-to-E4 Left Work Light
M2—Fuel Pump	X16—W1 Main Wiring Harness-to-E5 Right Turn/Hazard Light
R1—Manifold Heater	X17—W1 Main Wiring Harness-to-E7 Right Tail Light
S1—Key Switch	
S2—Light Switch	
S3—Rear PTO Switch	

Continued on next page

KN52281,10043E6 -19-16JAN13-1/2

X18—W1 Main Wiring Harness-to-E5/E7 Right Turn/Hazard and Tail Light Ground

X19—W1 Main Wiring Harness-to-E6 Left Turn/Hazard Light

X20—W1 Main Wiring Harness-to-E8 Left Tail Light

X21—W1 Main Wiring Harness-to-E6/E8 Left Turn/Hazard and Tail Light Ground

X57— W1 Main Wiring Harness-to-Front Hitch Detection.

W2—Headlights Wiring Harness

W3—Mid PTO Jumper Plug

W4—Jumper Plug (eHydro™)

W5—Right Work Light Wiring Harness (optional)

W6—Left Work Light Wiring Harness (optional)

W7—Right Rear Lights Wiring Harness

W8—Left Rear Lights Wiring Harness

Wiring Harnesses:

W1—Main Wiring Harness

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KN52281,10043E6 -19-16JAN13-2/2

W9 eHydro™/Auto HST—Schematic and Wiring Harness Legend

A2—Electronic Drive Controller

H2—Backup Alarm

S12—Load Match Switch (eHydro™)

S13—Res/+, Set/- Switch (optional)

S14—Cruise Control/Max Speed Switch (optional)

S15—Motion Match Switch (optional)

S16—Cruise Control Switch (standard)

S18—FNR Switch (Auto HST only)

T1—Forward/Drive Pedal Sensor

T2—Throttle Position Sensor

T3—MFWD Speed Sensor

T4—Reverse Pedal Sensor (eHydro™ only)

Y4—Reverse Proportional Solenoid

Y5—Forward Proportional Solenoid

Connectors:

X26—W9 eHydro™/Auto HST Wiring Harness to A2 Electronic Drive Controller

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X27—W9 eHydro™/Auto HST Wiring Harness to W10 Proportional Valve Wiring Harness

X28—W9 eHydro™/Auto HST Wiring Harness to W11 Cruise Control Wiring Harness (standard)

X28—W9 eHydro™/Auto HST Wiring Harness to W12 Cruise Control Wiring Harness (optional)

X29—W9 eHydro™/Auto HST Wiring Harness to T1 Forward Pedal Sensor

X30—W9 eHydro™/Auto HST Wiring Harness to T2 Throttle Position Sensor

X31—W9 eHydro™/Auto HST Wiring Harness to T3 MFWD Speed Sensor

X32—W9 eHydro™ Wiring Harness to T4 Reverse Pedal Sensor (eHydro™ only)

Wiring Harnesses:

W9—eHydro™/Auto HST Wiring Harness

W10—eHydro™/Auto HST Proportional Valve Wiring Harness

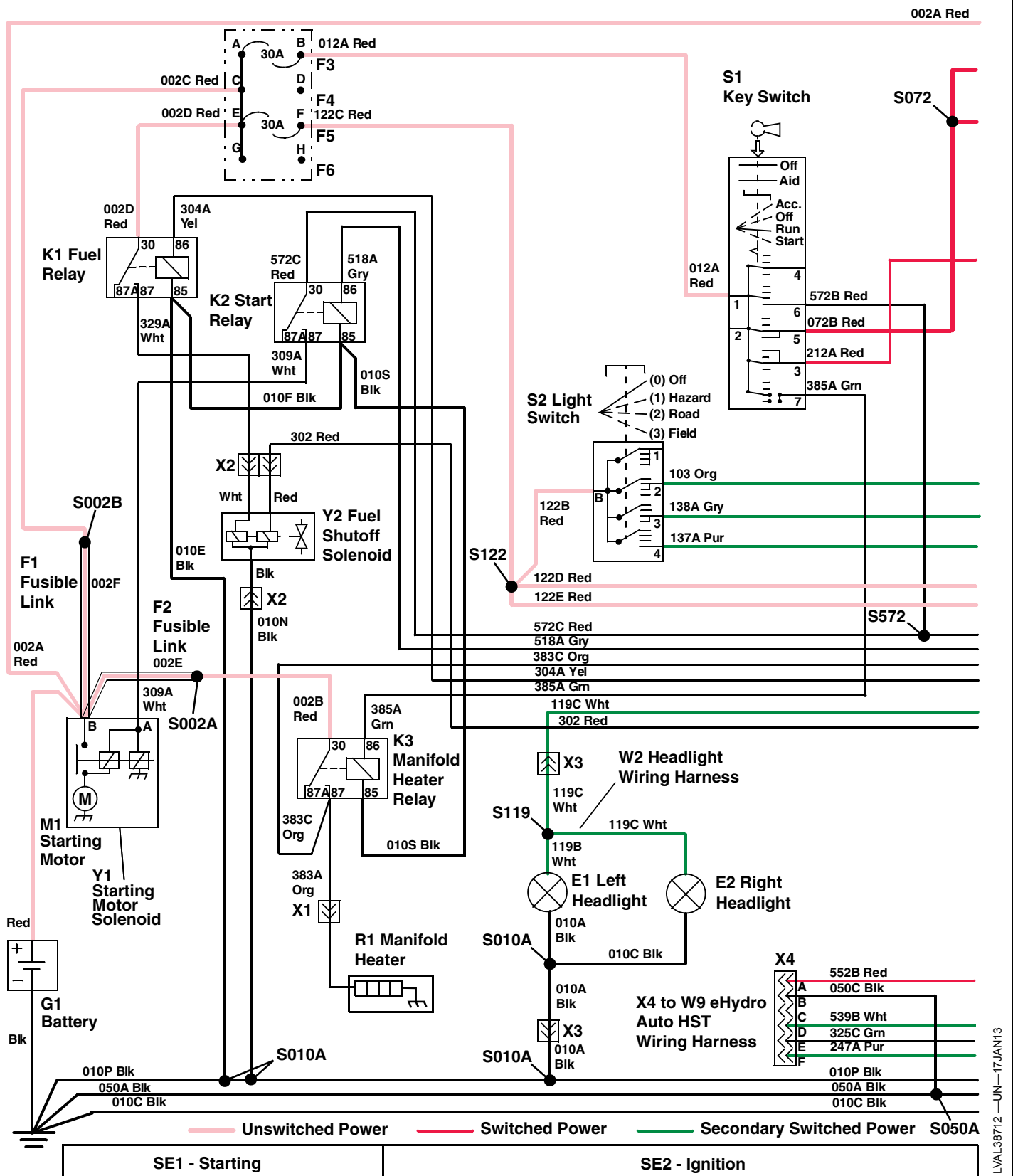
W11—Cruise Control Wiring Harness (standard)

W12—Cruise Control Wiring Harness (optional)

KN52281,10043E7 -19-16JAN13-1/1

W1 Main Wiring Schematic—MY13

W1 Main Wiring Schematic—MY13 (1 of 4)



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KN52281,10043E8 -19-16JAN13-1/8

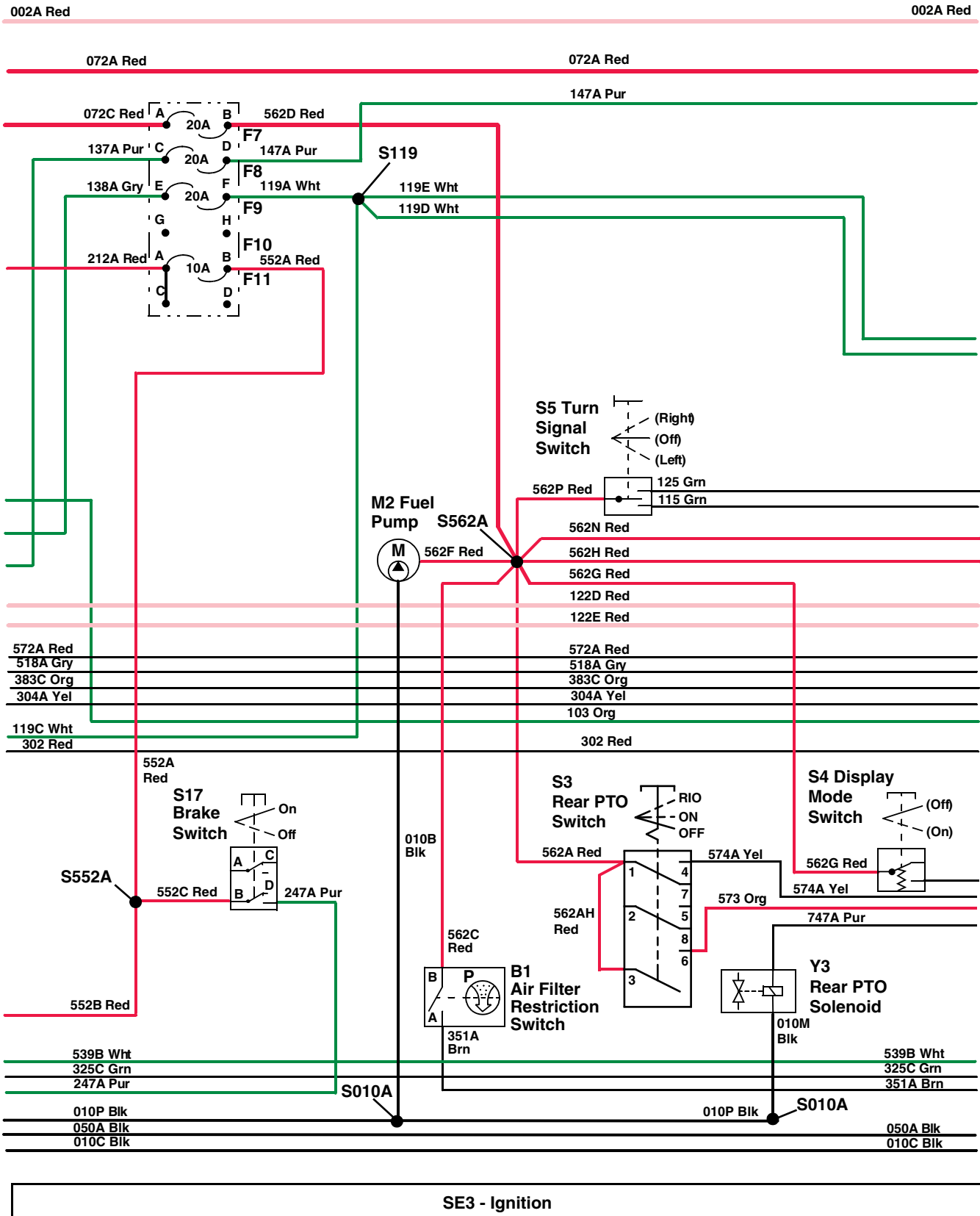
E1—Left Headlight	K3—Manifold Heater Relay	X2—W1 Main Wiring	Y1—Starting Motor Solenoid
E2—Right Headlight	M1—Starting Motor	Harness-to-Y2 Fuel Shutoff	Y2—Fuel Shutoff Solenoid
F1—Fusible Link	R1—Manifold Heater	Solenoid	
F2—Fusible Link	S1—Key Switch	X3—W1 Main Wiring	
F3—Fuse 30A	S2—Light Switch	Harness-to-W2 Headlight	
F4—Not Used	SE1—Starting	Wiring Harness	
F5—Fuse 30A	SE2—Ignition	X4—W1 Main Wiring Harness-	
F6—Not Used	W2—Headlights Wiring Harness	to-W9 eHydro™/Auto HST	
G1—Battery	X1—W1 Main Wiring	Wiring Harness	
K1—Fuel Relay	Harness-to-R1 Manifold		
K2—Start Relay	Heater		

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W1 Main Wiring Schematic—MY13 (2 of 4)



LVAL38713—UN—09JAN13

Continued on next page

KN52281,10043E8 -19-16JAN13-3/8

Schematics and Harnesses MY13

B1—Air Filter Restriction Switch
F7— Fuse 20A
F8— Fuse 20A

F9— Fuse 20A
F10— Not Used
F11— Fuse 10A
M2—Fuel Pump
S3— Rear PTO Switch

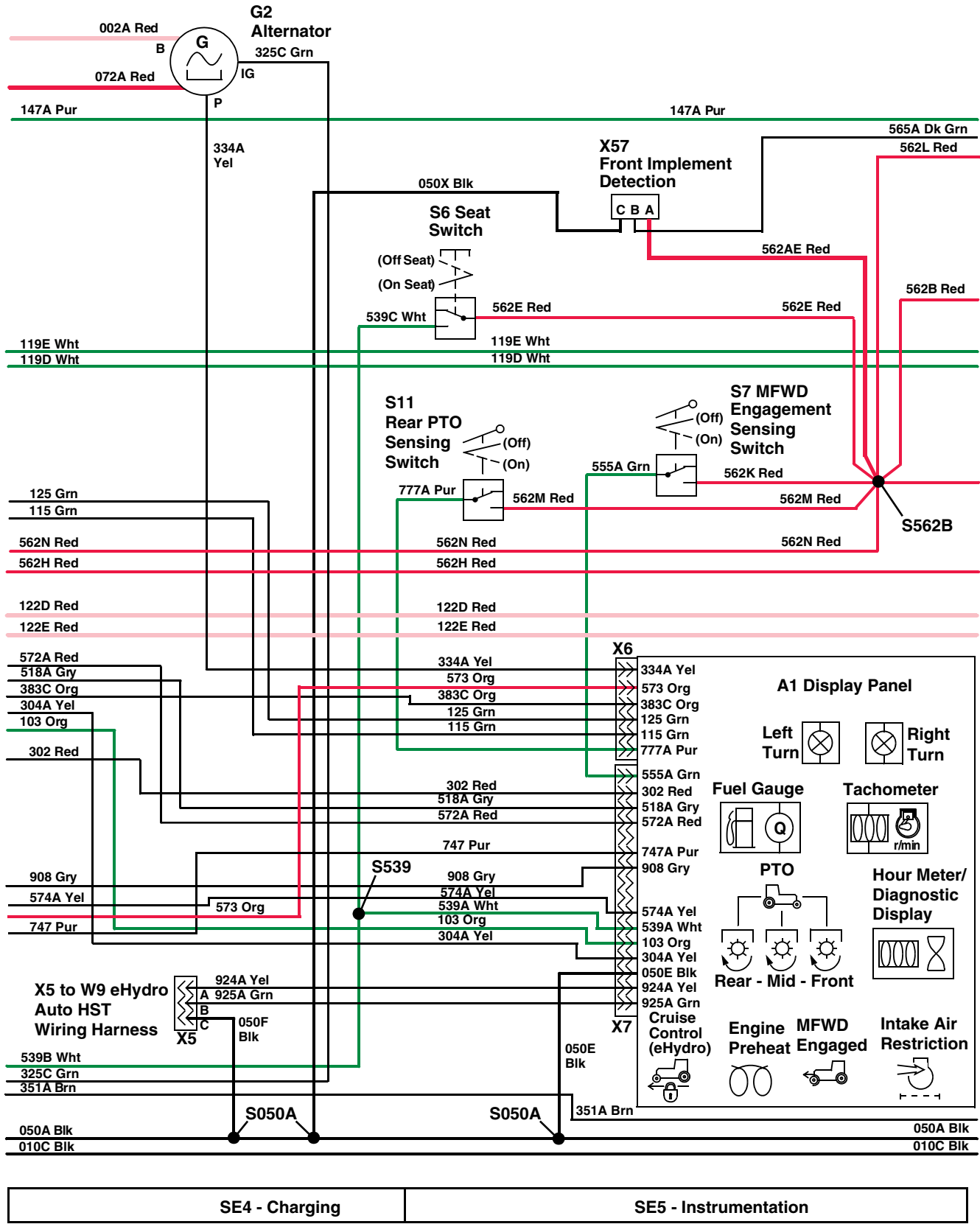
S4— Display Mode Switch
S5— Turn Signal Switch
S17— Brake Switch

SE3— Ignition
Y3—Rear PTO Solenoid

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KN52281,10043E8 -19-16JAN13-4/8

W1 Main Wiring Schematic—MY13 (3 of 4)



LVAL38714 —UN—22OCT112

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A1—Display Panel

G2—Alternator

S6—Seat Switch

S7—MFWD Engagement Sensing
Switch

S11— Rear PTO Sensing Switch

SE4— Charging

SE5— Instrumentation

X5— W1 Main Wiring Harness-
to-W9 eHydro™/Auto HST
Wiring Harness

X6— W1 Main Wiring

Harness-to-A1 Display Panel

X7— W1 Main Wiring

Harness-to-A1 Display Panel

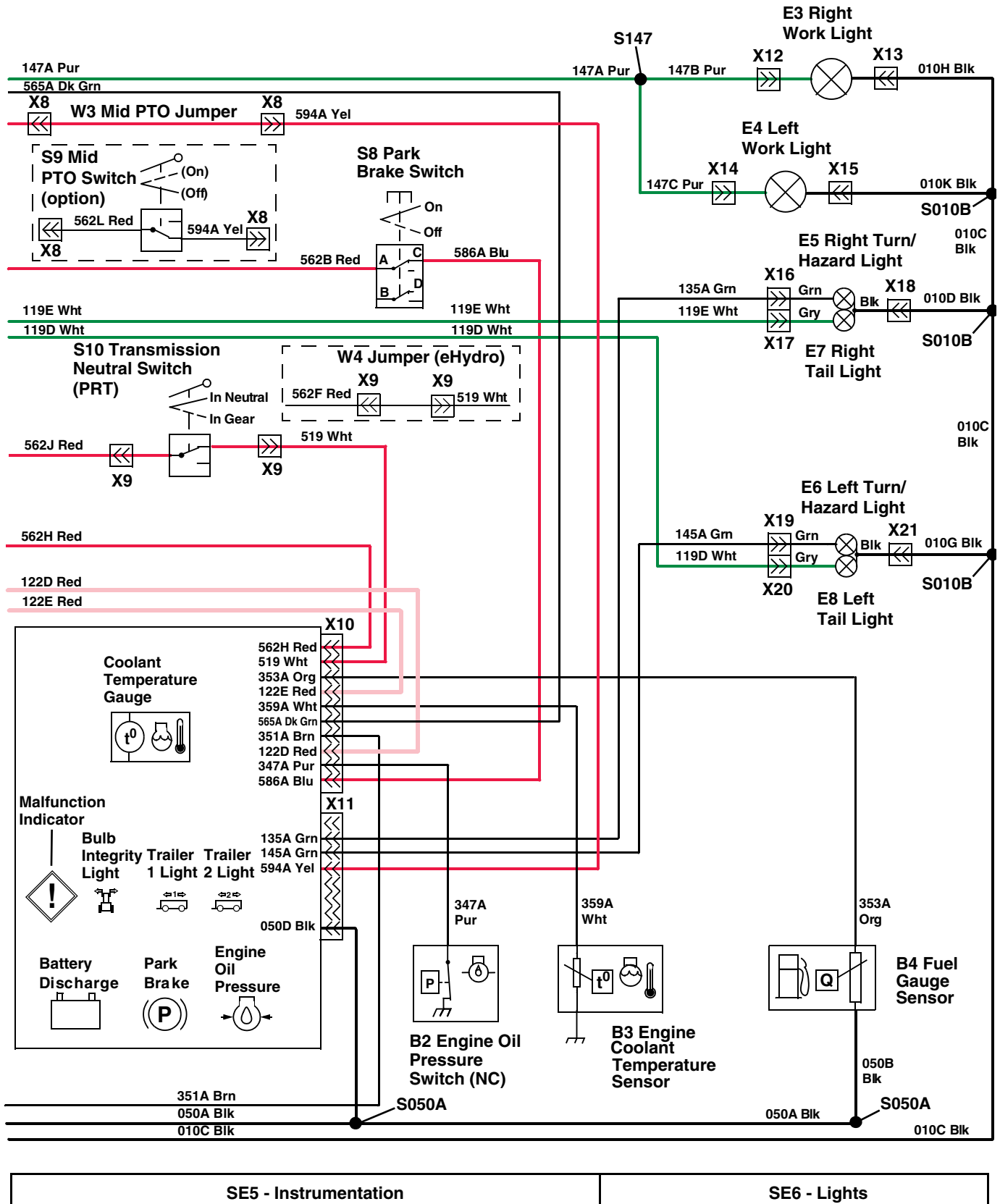
X57— Front Hitch Detection

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KN52281,10043E8 -19-16JAN13-6/8

W1 Main Wiring Schematic—MY13 (4 of 4)



LVAL38715—UN—05DEC12

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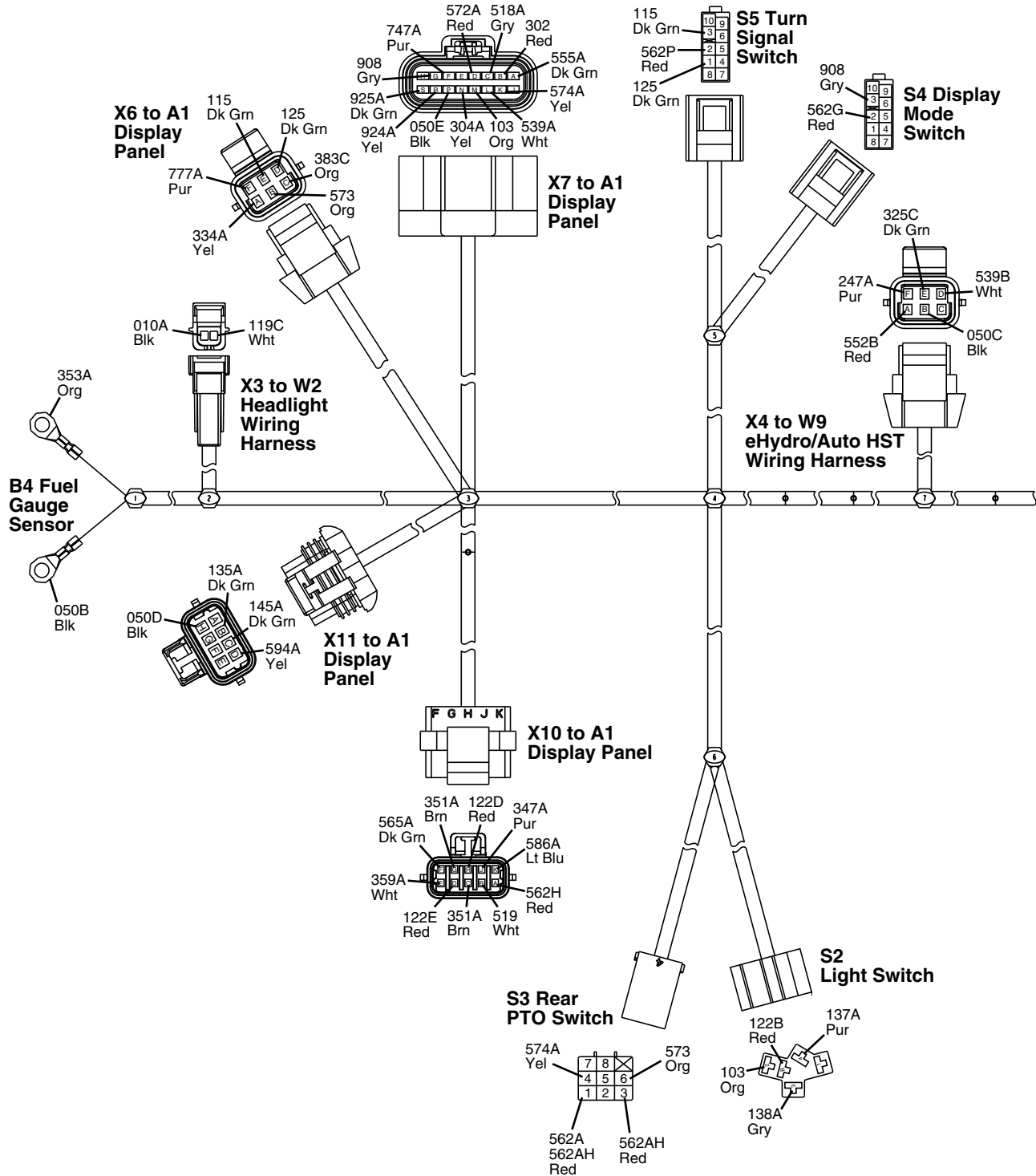
KN52281,10043E8 -19-16JAN13-7/8

B2—Engine Oil Pressure Switch	SE5— Instrumentation	X12— W1 Main Wiring	X19— W1 Main Wiring
B3—Engine Coolant Temperature Sensor	SE6— Lights	Harness-to-E3 Right Work Light	Harness-to-E6 Left Turn/Hazard Light
B4—Fuel Gauge Sensor	X8— W1 Main Wiring	X13— W1 Main Wiring	X20— W1 Main Wiring
E3—Right Work Light	Harness-to-W3 Jumper	Harness-to-E3 Right Work Light	Harness-to-E8 Left Tail Light
E4—Left Work Light	Plug (standard), S9 Mid PTO Sensing Switch (optional)	X14— W1 Main Wiring	X21— W1 Main Wiring
E5—Right Turn/Hazard Light	X9— W1 Main Wiring	Harness-to-E4 Left Work Light	Harness-to-E6/E8 Left Turn/Hazard and Tail Light
E6—Left Turn/Hazard Light	Harness-to-S10	X15— W1 Main Wiring	Ground
E7—Left Tail Light	Transmission Neutral Switch (PRT), W4 Jumper	Harness-to-E4 Left Work Light	W3—Mid PTO Jumper plug
E8—Right Tail Light	Plug (eHydro™)	X16— W1 Main Wiring	W4—Jumper plug (eHydro™)
S8—Park Brake Switch	X10— W1 Main Wiring	Harness-to-E5 Right Turn/Hazard Light	
S9—Mid PTO Sensing Switch (optional)	Harness-to-Display Panel	X17— W1 Main Wiring	
S10— Transmission Neutral Switch (PRT)	X11— W1 Main Wiring	Harness-to-E7 Right Tail Light	
	Harness-to-Display Panel	X18— W1 Main Wiring	
		Harness-to-E5/E7 Right Turn/Hazard and Tail Light	
		Ground	

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W1 Main Wiring Harness—MY13



W1 Main Wiring Harness—MY13 (1 of 3)

Continued on next page

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LVAL38602—UN—30OCT12

B4—Fuel Gauge Sensor
 S2—Light Switch
 S3—Rear PTO Switch
 S4—Display Mode Switch
 S5—Turn Signal Switch
 X3—W1 Main Wiring
 Harness-to-W2 Headlights
 Wiring Harness

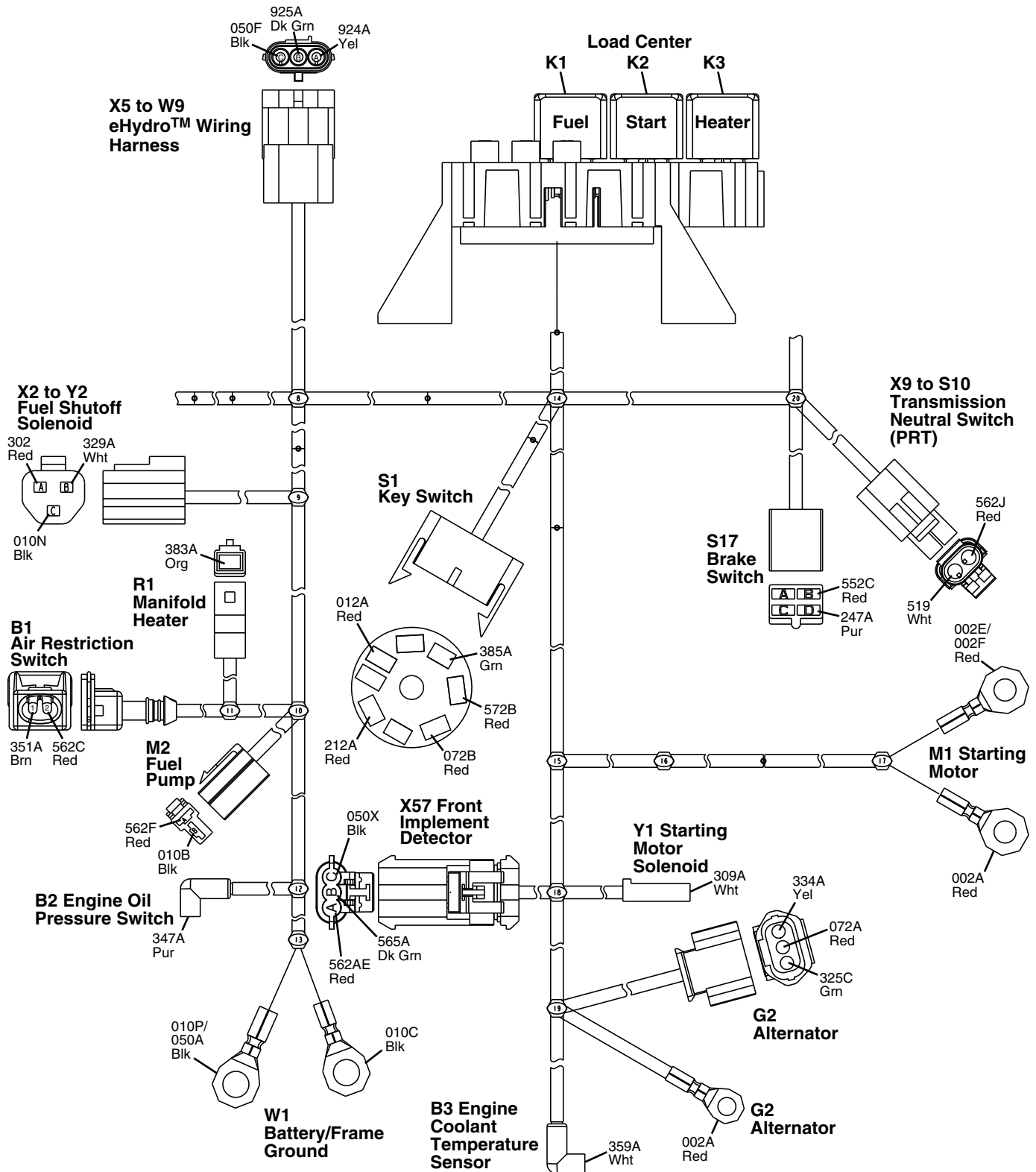
X4—W1 Main Wiring Harness-
 to-W9 eHydro™/Auto HST
 Wiring Harness
 X6—W1 Main Wiring
 Harness-to-A1 Display Panel

X7—W1 Main Wiring
 Harness-to-A1 Display Panel
 X10—W1 Main Wiring
 Harness-to-A1 Display
 Panel
 X11—W1 Main Wiring
 Harness-to-A1 Display
 Panel

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KN52281,10043E9 -19-15JAN13-2/6



LVAL38603—UN—09JAN13

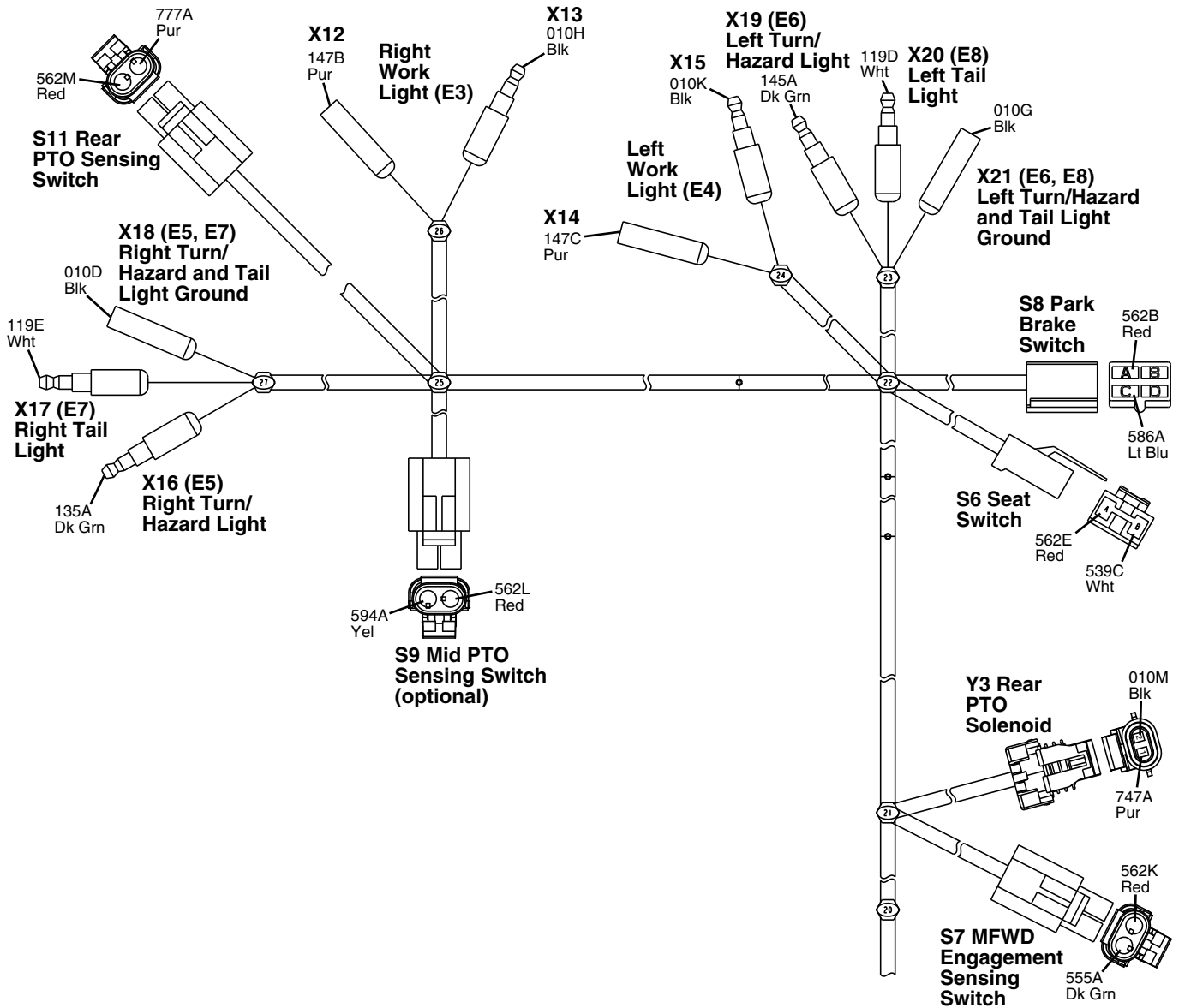
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KN52281,10043E9 -19-15JAN13-3/6

B1—Air Filter Restriction Switch	M1—Starting Motor	X5—W1 Main Wiring Harness- to-W9 eHydro™/Auto HST Wiring Harness	X57— W1 Main Wiring Harness-to-Front Hitch (Implement) Detection
B2—Engine Oil Pressure Switch	M2—Fuel Pump		
B3—Engine Coolant Temperature Sensor	R1—Manifold Heater	X9—W1 Main Wiring Harness-to-S10	Y1—Starting Motor Solenoid
G2—Alternator	S1—Key Switch		
K1—Fuel Relay	S17— Brake Switch	X9—W1 Main Wiring Harness-to-S10	
K2—Start Relay	W1—Battery/Frame Ground	Transmission Neutral Switch (PRT), W4 Jumper	
K3—Manifold Heater Relay	X2—W1 Main Wiring Harness-to-Y2 Fuel Shutoff Solenoid	Plug (eHydro™/Auto HST)	

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KN52281,10043E9 -19-15JAN13-4/6



W1 Main Wiring Harness—MY13 (3 of 3)

Continued on next page

KN52281,10043E9 -19-15JAN13-5/6

LVAL38604—UN—09JAN13

S6—Seat Switch	X13— W1 Main Wiring Harness-to-E3 Right Work Light	X17— W1 Main Wiring Harness-to-E7 Right Tail Light	X20— W1 Main Wiring Harness-to-E8 Left Tail Light
S7—MFWD Engagement Sensing Switch	X14— W1 Main Wiring Harness-to-E4 Left Work Light	X18— W1 Main Wiring Harness-to-E5/E7 Right Turn/Hazard and Tail Light Ground	X21— W1 Main Wiring Harness-to-E6/E8 Left Turn/Hazard and Tail Light Ground
S8—Park Brake Switch	X15— W1 Main Wiring Harness-to-E4 Left Work Light	X19— W1 Main Wiring Harness-to-E6 Left Turn/Hazard Light	Y3—Rear PTO Solenoid
S9—Mid PTO Sensing Switch (optional)	X16— W1 Main Wiring Harness-to-E5 Right Turn/Hazard Light		
S11— Rear PTO Sensing Switch			
X12— W1 Main Wiring Harness-to-E3 Right Work Light			

KN52281,10043E9 -19-15JAN13-6/6

W1 Main Wiring Harness Color Codes—MY13

Size/No./Color	Wire Connection Points
5.0 002A Red	M1, G2
5.0 002B Red	F2 Fusible Link, K3
5.0 002C Red	F1 Fusible Link, Fuse Block
5.0 002D Red	Fuse Block, K1
2.0 002E Fuse Link	F2 Fusible Link—M1, 002B
2.0 002F Fuse Link	F1 Fusible Link—M1, 002C
1.0 010A Blk	X3, Splice
1.0 010B Blk	M2, Splice
3.0 010C Blk	Splice, W1
0.8 010D Blk	X18, Splice
0.8 010E Blk	K1, Splice
0.8 010F Blk	K1, K2
0.8 010G Blk	X21, Splice
1.0 010H Blk	X13, Splice
1.0 010K Blk	X19, Splice
0.8 010M Blk	Y3, Splice
3.0 010N Blk	X2, Splice
3.0 010P Blk	W1, Splice
0.8 010S Blk	K2, K3
3.0 012A Red	Fuse Block, S1
2.0 050A Blk	W1, Splice
0.8 050B Blk	Splice, B4
0.8 050C Blk	X4, Splice
0.8 050D Blk	X11, Splice
0.8 050E Blk	X7, Splice
0.8 050F Blk	Splice, X5
0.8 050X Blk	X57, Splice
0.8 072A Red	Splice, G2
1.0 072B Red	S1, Splice
1.0 072C Red	Splice, Fuse Block
0.8 103 Org	S2, X7
0.8 115 Grn	S5, X6
1.0 119A Wht	Fuse Block, Splice
1.0 119C Wht	Splice, X3
0.8 119D Wht	Splice, X20
0.8 119E Wht	Splice, X17
3.0 122B Red	Splice, S2
3.0 122C Red	Fuse Block, Splice
1.0 122D Red	Splice, X10
1.0 122E Red	Splice, X10
0.8 125 Grn	S5, X6
0.8 135A Grn	X11, X16
1.0 137A Pur	S2, Fuse Block
2.0 138A Gry	S2, Fuse Block
0.8 145A Grn	X11, X19
2.0 147A Pur	Fuse Block, Splice
1.0 147B Pur	Splice, X12
1.0 147C Pur	Splice, X14
1.0 212A Red	S1, Fuse Block
0.8 247A Pur	X4, S17

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KN52281,10043EA -19-14DEC12-1/2

Size/No./Color	Wire Connection Points
1.0 302 Red	X2, X7
0.8 304A Yel	K1, X7
2.0 309A Wht	Y1, K2
1.0 325C Grn	X4, G2
3.0 329A Wht	K1, X2
0.8 334A Yel	G2, X6
0.8 347A Pur	X10, B2
0.8 351A Brn	B1, X10
0.8 353A Org	X10, B4
0.8 359A Wht	X10, B3
3.0 383A Org	K3, R1
0.8 383C Org	K3, X6
0.8 385A Grn	S1, K3
0.8 518A Gry	K2, X7
0.8 519 Wht	X9, X10
0.8 539A Wht	X7, Splice
0.8 539B Wht	X4, Splice
0.8 539C Wht	Splice, S6
0.8 552A Red	Fuse Block, Splice
0.8 552B Red	Splice, X4
0.8 552C Red	Splice, S17
0.8 555A Grn	S7, X7
0.8 562AD Red	
0.8 562AE Red	X57,Splice
0.8 562AH Red	S3,S3
0.8 562A Red	Splice, S3
0.8 562B Red	Splice, S8
0.8 562C Red	Splice, B1
1.0 562D Red	Fuse Block, Splice
0.8 562E Red	S6, Splice
1.0 562F Red	Splice, M2
0.8 562G Red	Splice, S4
0.8 562H Red	Splice, X10
0.8 562J Red	Splice, X9
0.8 562K Red	S7, Splice
0.8 562L Red	Splice, S9
0.8 562M Red	S11, Splice
0.8 562N Red	Splice, Splice
0.8 562P Red	Splice, S5
0.8 565A Grn	X57,X10
0.8 572A Red	Splice, X7
1.0 572B Red	S1, Splice
1.0 572C Red	K2, Splice
0.8 573 Org	S3, X6
0.8 574A Yel	S3, X7
0.8 586A Lt Blu	S8, X10
0.8 594A Yel	S9, X11
0.8 747A Pur	Y3,X7
0.8 777A Pur	S11, X6
0.8 908 Gry	S4, X7

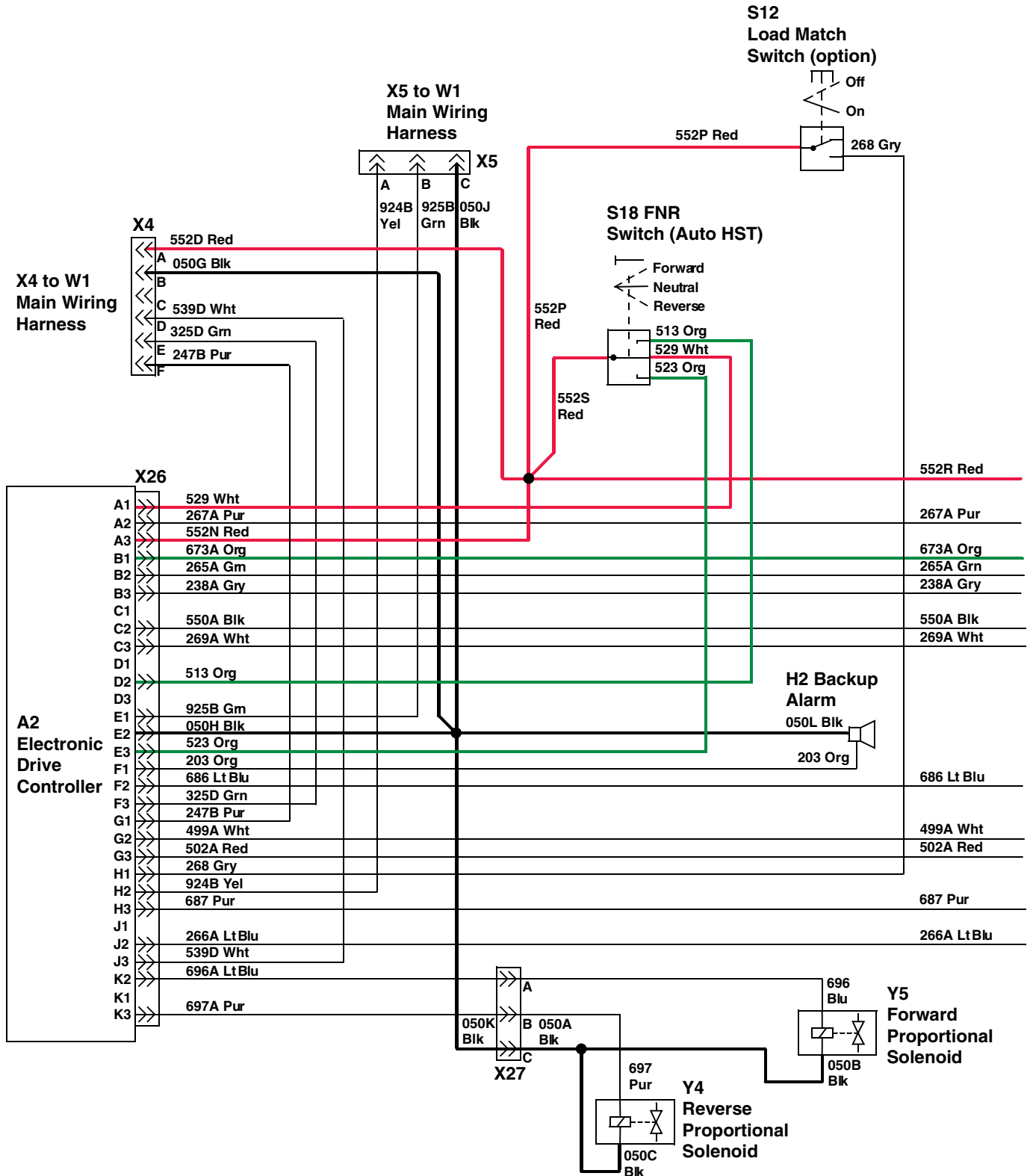
Schematics and Harnesses MY13

Size/No./Color	Wire Connection Points
0.8 924A Yel	X5, X7
0.8 925A Grn	X5, X7

KN52281,10043EA -19-14DEC12-3/2

W9 eHydro™/Auto HST and Cruise Control Electrical Schematic—MY13

W9 eHydro™/Auto HST Schematic—MY13 (1 of 2)



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KN52281,10043EB -19-16JAN13-1/4

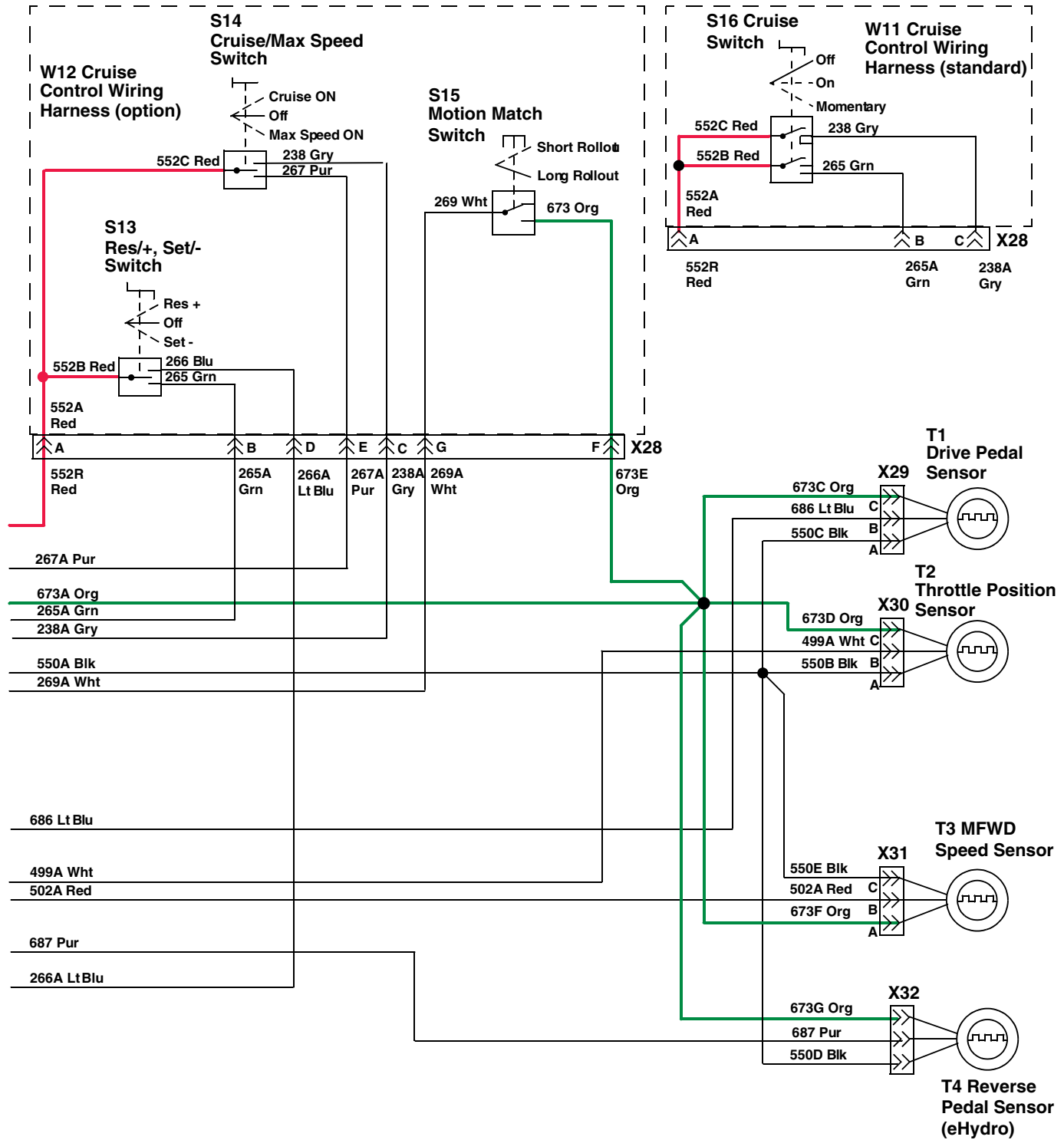
A2—Electronic Drive Controller	X5—W1 Main Wiring Harness-	X27— W9 eHydro™/Auto HST
H2—Backup Alarm	to-W9 eHydro™/Auto HST	Wiring Harness-to-W10
S12— Load Match Switch	Wiring Harness	Proportional Valve Wiring
(eHydro™)	X26— W9 eHydro™/Auto HST	Harness
S18— FNR Switch (Auto HST)	Wiring Harness-to-A2	Y4—Reverse Proportional
X4—W1 Main Wiring Harness-	Electronic Drive Controller	Solenoid
to-W9 eHydro™/Auto HST		Y5—Forward Proportional
Wiring Harness		Solenoid

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KN52281,10043EB -19-16JAN13-2/4

W9 eHydro™/Auto HST Schematic—MY13 (2 of 2)



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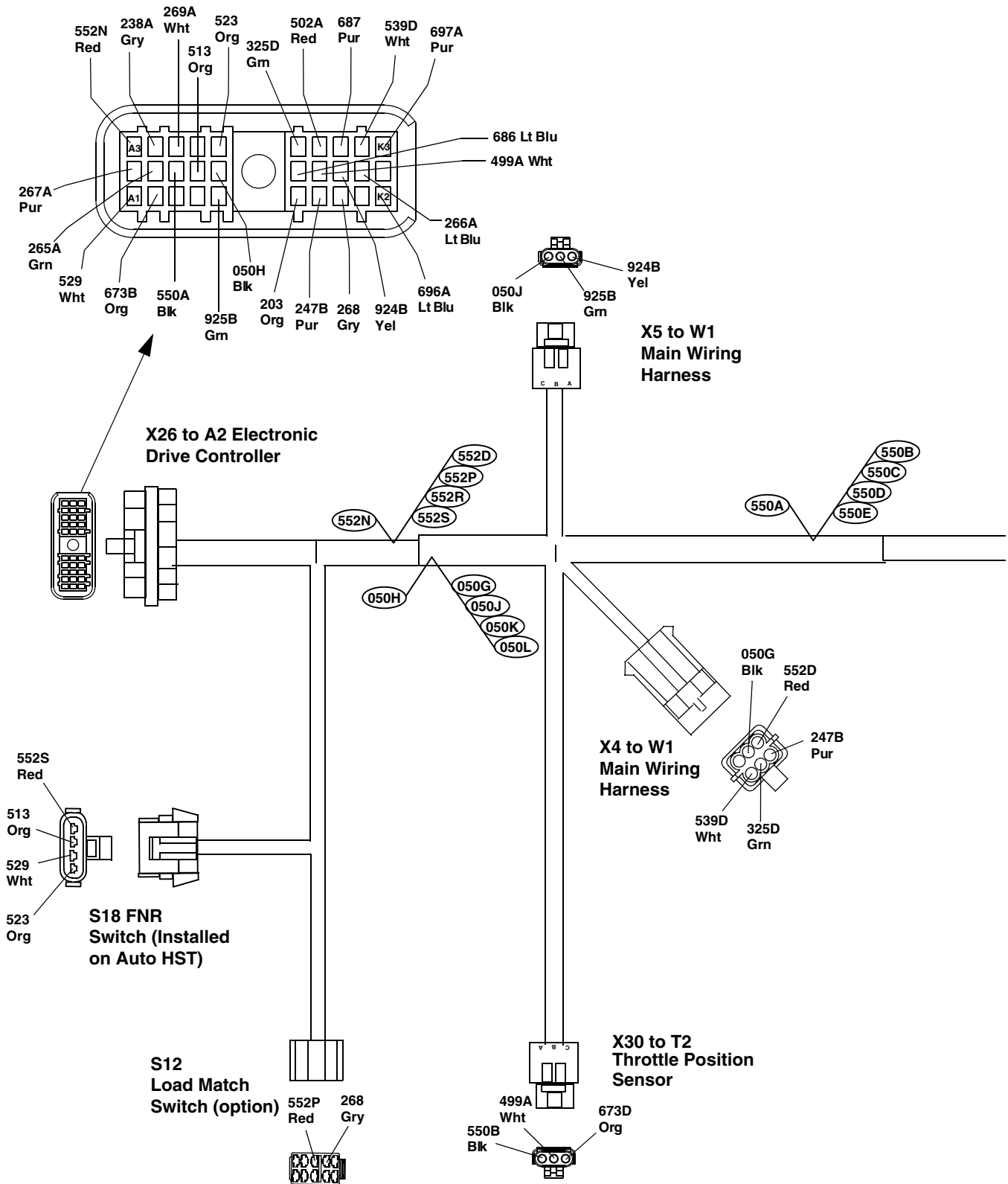
KN52281,10043EB -19-16JAN13-3/4

S13— Res/+, Set/- Switch (optional)	T4— Reverse Pedal Sensor (eHydro™ only)	X28— W9 eHydro™/Auto HST Wiring Harness-to-W12 Cruise Control Wiring Harness (optional)	X31— W9 eHydro™/Auto HST Wiring Harness-to-T3 MFWD Speed Sensor
S14— Cruise Control/Max Speed Switch (optional)	W11— Cruise Control Wiring Harness (standard)	X29— W9 eHydro™/Auto HST Wiring Harness-to-T1 Drive/Forward Pedal Sensor	X32— W9 eHydro™/Auto HST Wiring Harness-to-T4 Reverse Pedal Sensor (eHydro™ only)
S15— Motion Match Switch (optional)	W12— Cruise Control Wiring Harness (optional)	X30— W9 eHydro™/Auto HST Wiring Harness-to-T2 Throttle Position Sensor	
S16— Cruise Control Switch (standard)	X28— W9 eHydro™/Auto HST Wiring Harness-to-W11 Cruise Control Wiring Harness (standard)		
T1— Forward/Drive Pedal Sensor			
T2— Throttle Position Sensor			
T3— MFWD Speed Sensor			

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KN52281,10043EB -19-16JAN13-4/4

W9 eHydro™/Auto HST Wiring Harness—MY13



W9 eHydro™/Auto HST Wiring Harness—MY13 (1 of 2)

Continued on next page

KN52281,10043EC -19-16JAN13-1/4

LVAL11560 —UN—02NOV10

S12— Load Match Switch
(eHydro™)
S18— FNR Switch (Auto HST)

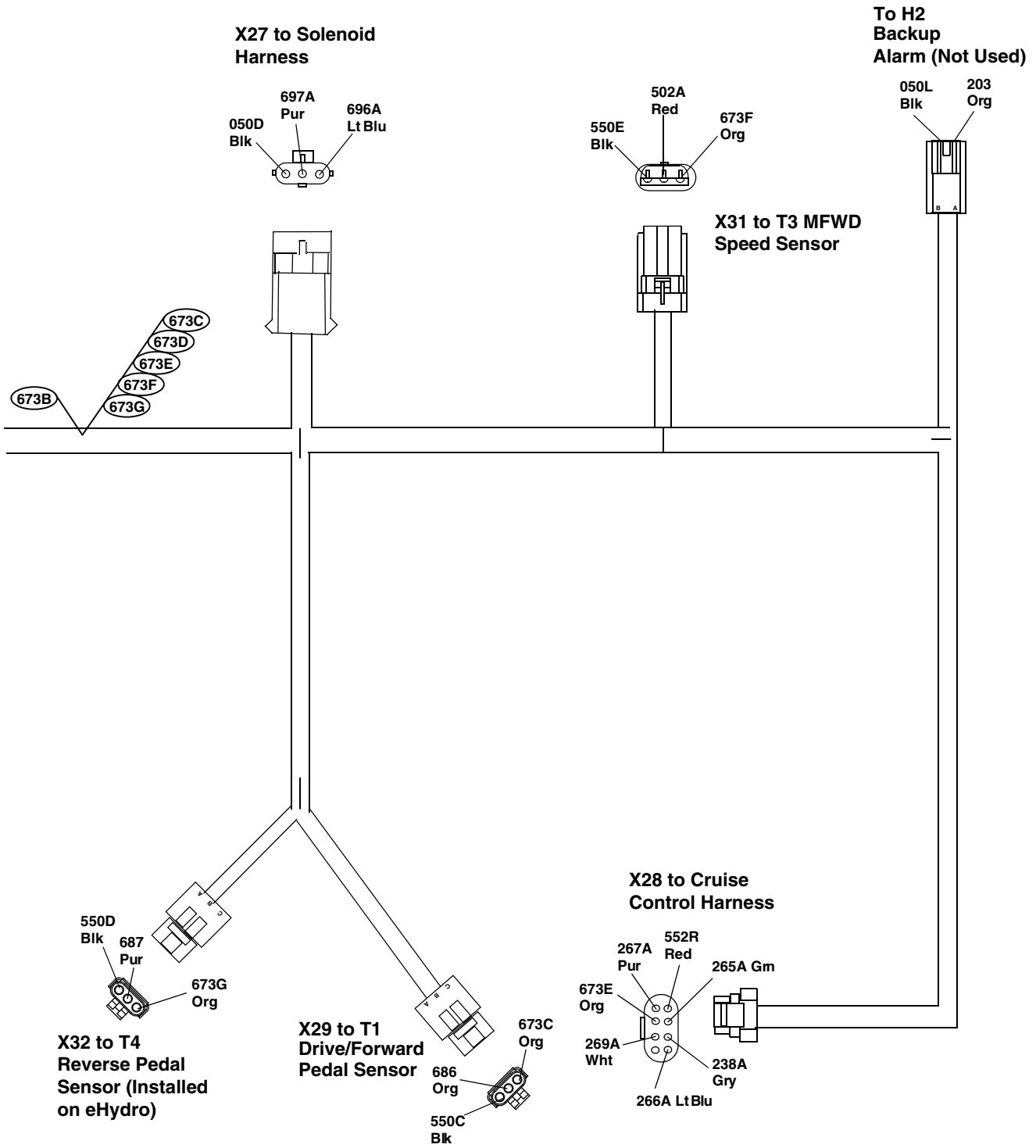
X4— W1 Main Wiring Harness-
to-W9 eHydro™/Auto HST
Wiring Harness
X5— W1 Main Wiring Harness-
to-W9 eHydro™/Auto HST
Wiring Harness

X26— W9 eHydro™/Auto HST
Wiring Harness-to-A2
Electronic Drive Controller
X30— W9 eHydro™/Auto HST
Wiring Harness-to-T2
Throttle Position Sensor

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KN52281,10043EC -19-16JAN13-2/4



W9 eHydro™/Auto HST Wiring Harness—MY13 (2 of 2)

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KN52281,10043EC -19-16JAN13-3/4

H2—Backup Alarm (not used)
X27— W9 eHydro™/Auto HST
Wiring Harness-to-W10
Proportional Valve Wiring
Harness

X28— W9 eHydro™/Auto HST
Wiring Harness-to-W12
Cruise Control Wiring
Harness (optional)
X29— W9 eHydro™/Auto HST
Wiring Harness-to-T1
Forward/Drive Pedal
Sensor

X31— W9 eHydro™/Auto HST
Wiring Harness-to-T3
MFWD Speed Sensor
X32— W9 eHydro™/Auto HST
Wiring Harness-to-T4
Reverse Pedal Sensor
(eHydro™ only)

eHydro is a trademark of Deere & Company

KN52281,10043EC -19-16JAN13-4/4

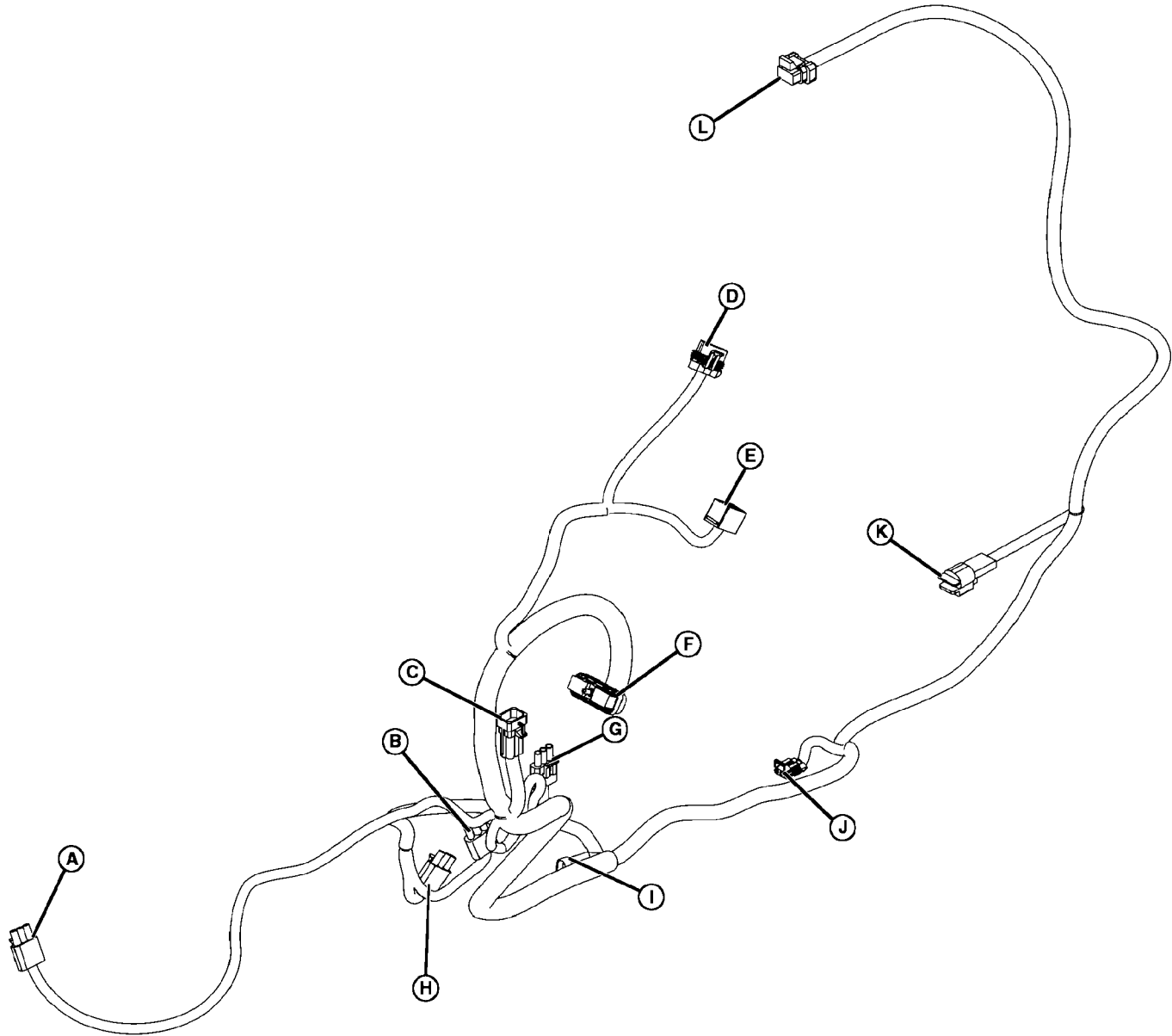
W9 eHydro™/Auto HST Wiring Harness

Color Codes—MY13

Size/No./Color	Wire Connection Points
0.8 050G Blk	Splice 050, X4
0.8 050H Blk	X26, Splice 050
0.8 050J Blk	Splice 050, X5
0.8 050K Blk	Splice 050, X27
0.8 050L Blk	Splice 050, H2
0.8 203 Org	X26, H2
0.8 238A Gry	X26, X28
0.8 247B Pur	X26, X4
0.8 265A Grn	X26, X28
0.8 266A Lt Blu	X26, X28
0.8 267A Pur	X26, X28
0.8 268 Gry	X26, S12
0.8 269A Wht	X26, X28
0.8 325D Grn	X26, X4
0.8 499A Wht	X26, T2
0.8 502A Red	X26, T3
0.8 513 Org	X26, S18
0.8 523 Org	X26, S18
0.8 529 Wht	X26, S18
0.8 539D Wht	X4, X26
0.8 550A Blk	X26, Splice 550
0.8 550B Blk	Splice 550, T2
0.8 550C Blk	Splice 550, T1
0.8 550D Blk	Splice 550, T4
0.8 550E Blk	Splice 550, T3
0.8 552D Red	Splice 552, X4
0.8 552N Red	X26, Splice 552
0.8 552P Red	Splice 552, S12
0.8 552R Red	Splice 552, X28
0.8 552S Red	Splice 552, S18
0.8 673B Org	X26, Splice 673
0.8 673C Org	Splice 673, T1
0.8 673D Org	Splice 673, T2
0.8 673E Org	Splice 673, X28
0.8 673F Org	Splice 673, T3
0.8 673G Org	Splice 673, T4
0.8 686 Lt Blu	X26, T1
0.8 687 Pur	X26, T4
0.8 696A Lt Blu	X26, X27
0.8 697A Pur	X26, X27
0.8 924B Yel	X26, X5
0.8 925B Grn	X26, X5

KN52281,10043ED -19-15JAN13-1/1

W9 eHydro™/Auto HST Wiring Harness—MY13



Left Front View

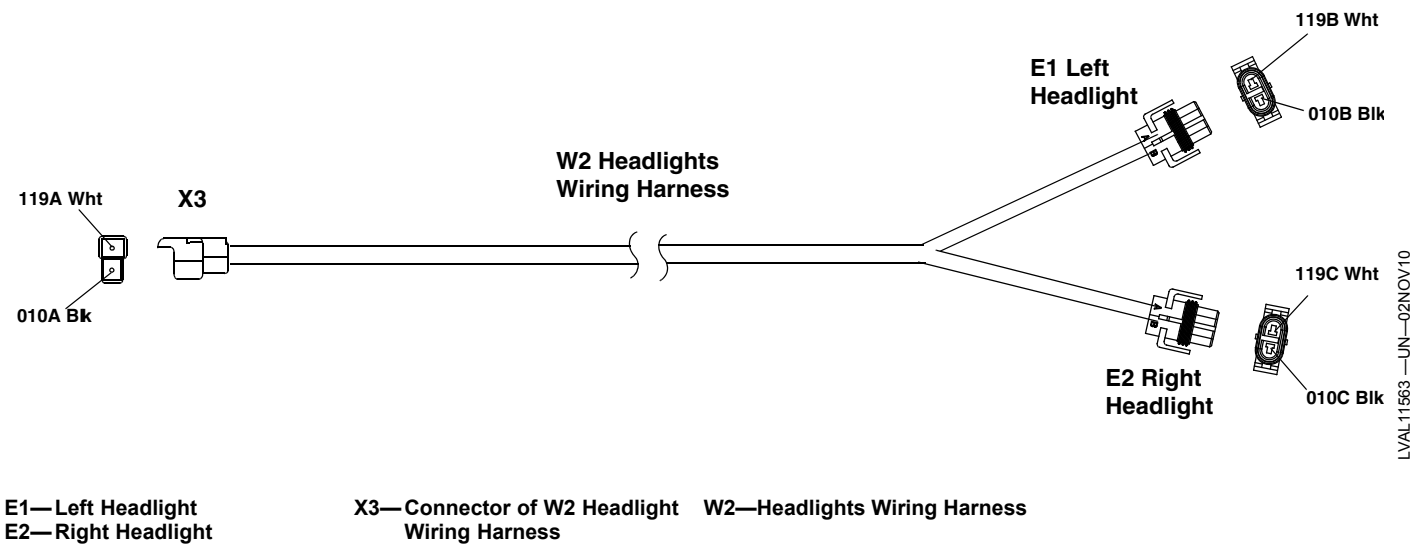
- | | | | |
|---|--|---|--|
| A—T2 Throttle Position Sensor | D—S18 FNR Switch (Auto HST only) | H—X5 W1 Main Wiring Harness-to-W9 eHydro™/Auto HST Wiring Harness Connector | K—H2 Back Up Alarm (not used) |
| B—T1 Forward/Drive Pedal Sensor | E—S12 Load Match Switch | I—X27 W9 eHydro™/Auto HST Wiring Harness-to-W10 Proportional Valve Wiring Harness Connector | L—X28 W9 eHydro™/Auto HST Wiring Harness-to-W11 or W12 Cruise Control Wiring Harness Connector |
| C—X4 W1 Main Wiring Harness-to-W9 eHydro™/Auto HST Wiring Harness Connector | F—X26 W9 eHydro™/Auto HST Wiring Harness-to-A2 Electronic Drive Controller | J—T3 MFWD Speed Sensor | |
| | G—T4 Reverse Pedal Sensor (eHydro™ only) | | |

eHydro is a trademark of Deere & Company

LVAL11562 —UN—02NOV10

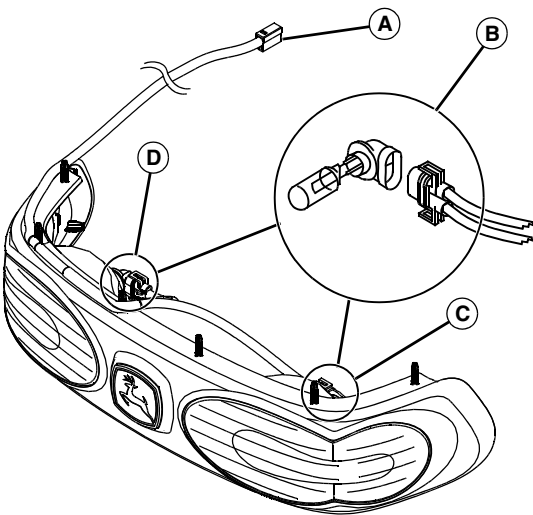
KN52281,10043EE -19-16JAN13-1/1

W2 Headlights Wiring Harness



KN52281,10043EF -19-02NOV12-1/2

- A—X3 Connector of W2 Headlight Wiring Harness
- B—E1 and E2 Headlight Detail
- C—E1 Left Headlight
- D—E2 Right Headlight



LVAL11564 —UN—02NOV10

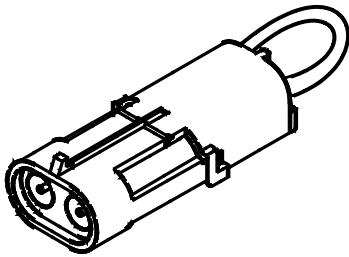
KN52281,10043EF -19-02NOV12-2/2

W2 Headlight/Horn Wiring Harness Color Codes

Size/No./Color	Wire Connection Points
1.3 010A Blk	X3, Splice
1.3 010B Blk	Splice, E1
1.3 010C Blk	Splice, E2
1.3 119A Wht	X3, Splice
1.3 119B Wht	Splice, E1
1.3 119C Wht	Splice, E2

KN52281,10043F0 -19-02NOV12-1/1

W3 and W4 Jumper Plug

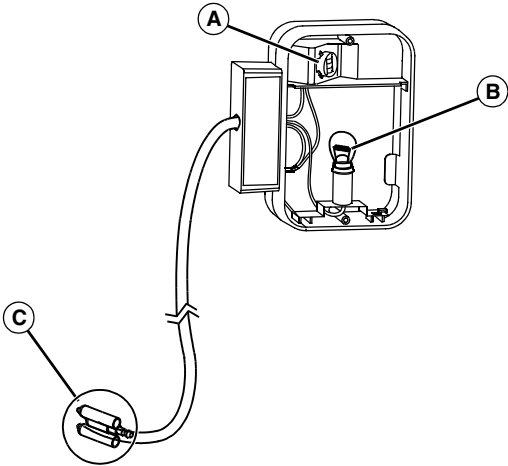


LVAL11565 —UN—02NOV10

KN52281,10043F1 -19-02NOV12-1/1

W7 Left Rear Lights Wiring Harness—Pre MY08

A—E8 Left Turn Light
B—E6 Left Hazard Light
C—X19, X20, and X21 Connectors

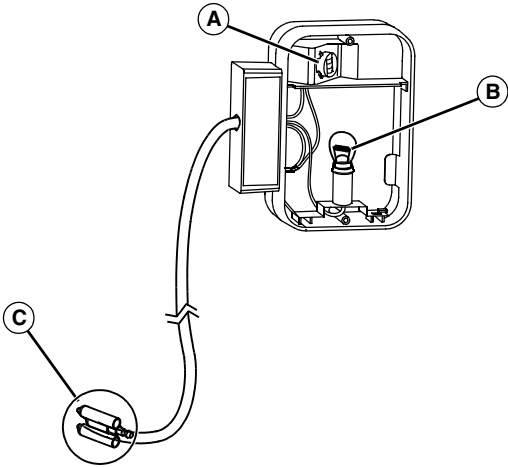


LVAL11566 —UN—02NOV10

KN52281,10043F2 -19-04JAN13-1/1

W7 Left Rear Lights Wiring Harness—MY08 and MY13

A—E8 Left Tail Light
B—E6 Left Turn/Hazard Light
C—X19, X20, and X21 Connectors



LVAL11566 —UN—02NOV10

OOU1010,0001861 -19-04JAN13-1/1

W7 Left Rear Lights Wiring Harness Color Codes

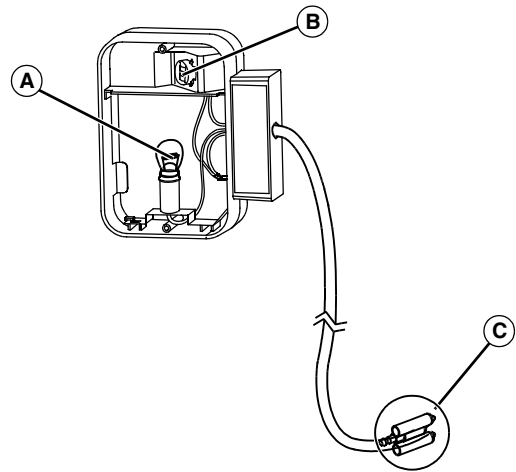
Size/No./Color	Wire Connection Points
1.0 Grn	X19, E6
1.0 Gry	X20, E8
1.0 Blk	X21, E6 and E8

KN52281,10043F3 -19-02NOV12-1/1

W8 Right Rear Lights Wiring Harness—Pre MY08

A—E5 Right Hazard Light
B—E7 Right Turn Light

C—X16, X17, and X18
Connectors



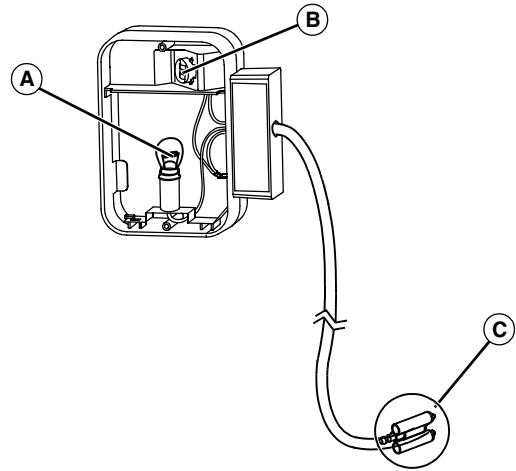
KN52281,10043F4 -19-04JAN13-1/1

LVAL11567 —UN—02NOV10

W8 Right Rear Lights Wiring Harness—MY08 and MY13

A—E5 Right Turn/Hazard Light
B—E7 Right Tail Light

C—X16, X17, and X18
Connectors



OQO1010,0001862 -19-04JAN13-1/1

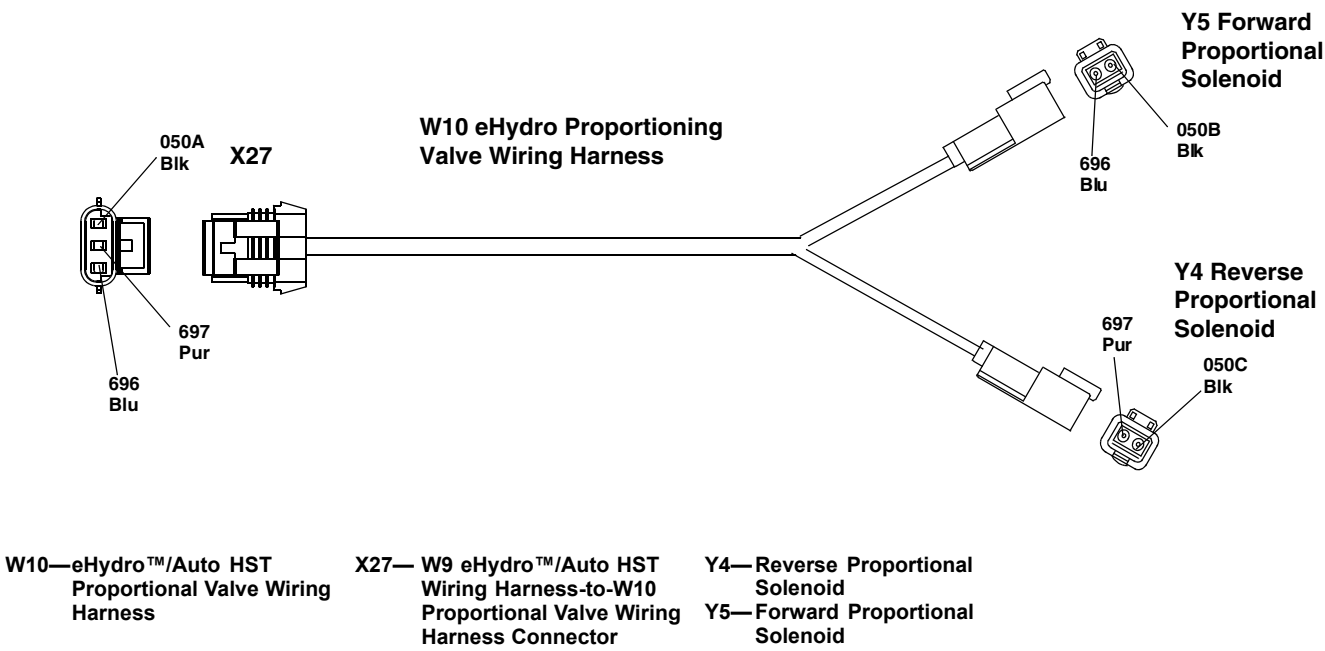
LVAL11567 —UN—02NOV10

W8 Right Rear Lights Wiring Harness Color Codes

Size/No./Color	Wire Connection Points
1.0 Grn	X16, E5
1.0 Gry	X17, E7
1.0 Blk	X18, E5 and E7

KN52281,10043F5 -19-02NOV12-1/1

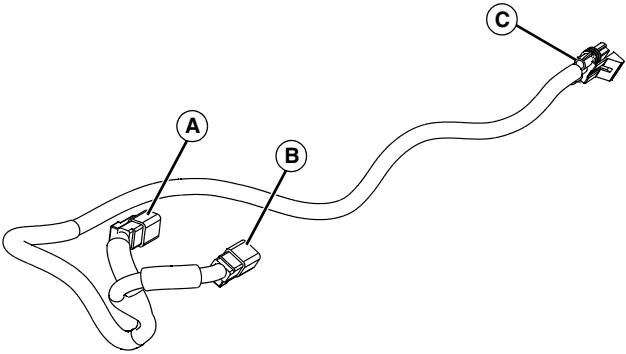
W10 eHydro™/Auto HST Proportional Valve Wiring Harness



LVAL11568 —UN—02NOV10

KN52281,10043F6 -19-04JAN13-1/2

- A—Y5 Forward Proportional Solenoid
- B—Y4 Reverse Proportional Solenoid
- C—X27 W9 eHydro™/Auto HST Wiring Harness-to-W10 Proportional Valve Wiring Harness Connector



LVAL11569 —UN—02NOV10

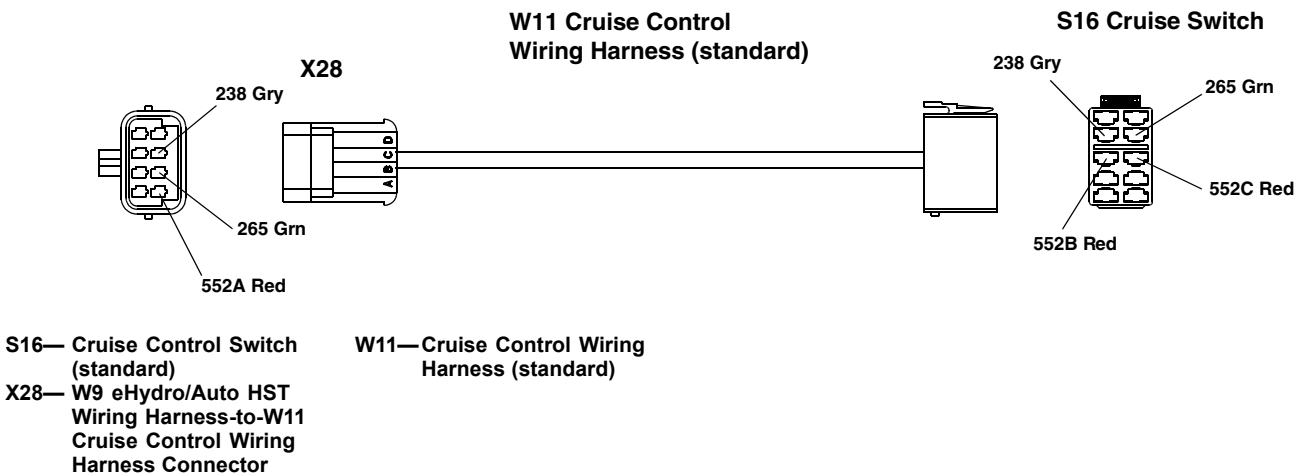
KN52281,10043F6 -19-04JAN13-2/2

W10 eHydro™/Auto HST Proportional Valve Wiring Harness Color Codes

Size/No./Color	Wire Connection Points
1.0 050A Blk	X27, Splice
1.0 050B Blk	Splice, Y5
1.0 050C Blk	Splice, Y4
1.0 696 Blu	X27, Y5
1.0 697 Pur	X27, Y4

KN52281,10043F7 -19-02NOV12-1/1

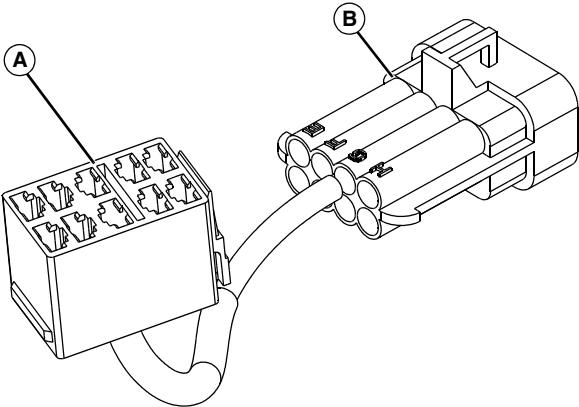
W11 eHydro™/Auto HST Cruise Control Wiring Harness (Standard)



LVAL11570 —UN—02NOV10

KN52281,10043F8 -19-04JAN13-1/2

A—S16 Cruise Control Switch (standard)
B—X28 W9 eHydro/Auto HST Wiring Harness-to-W11 Cruise Control Wiring Harness Connector



LVAL11571 —UN—02NOV10

KN52281,10043F8 -19-04JAN13-2/2

W11 eHydro™/Auto HST Cruise Control Wiring Harness Color Codes (Standard)

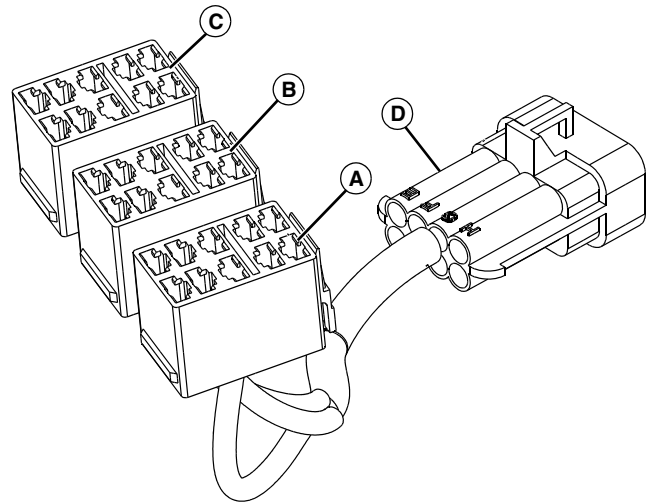
Size/No./Color	Wire Connection Points
0.8 238 Gry	X28, S16
0.8 265 Grn	X28, S16
0.8 552A Red	X28, Splice
0.8 552B Red	Splice, S16
0.8 552C Red	Splice, S16

KN52281,10043F9 -19-02NOV12-1/1

W12 eHydro™/Auto HST Cruise Control Wiring Harness (Optional)

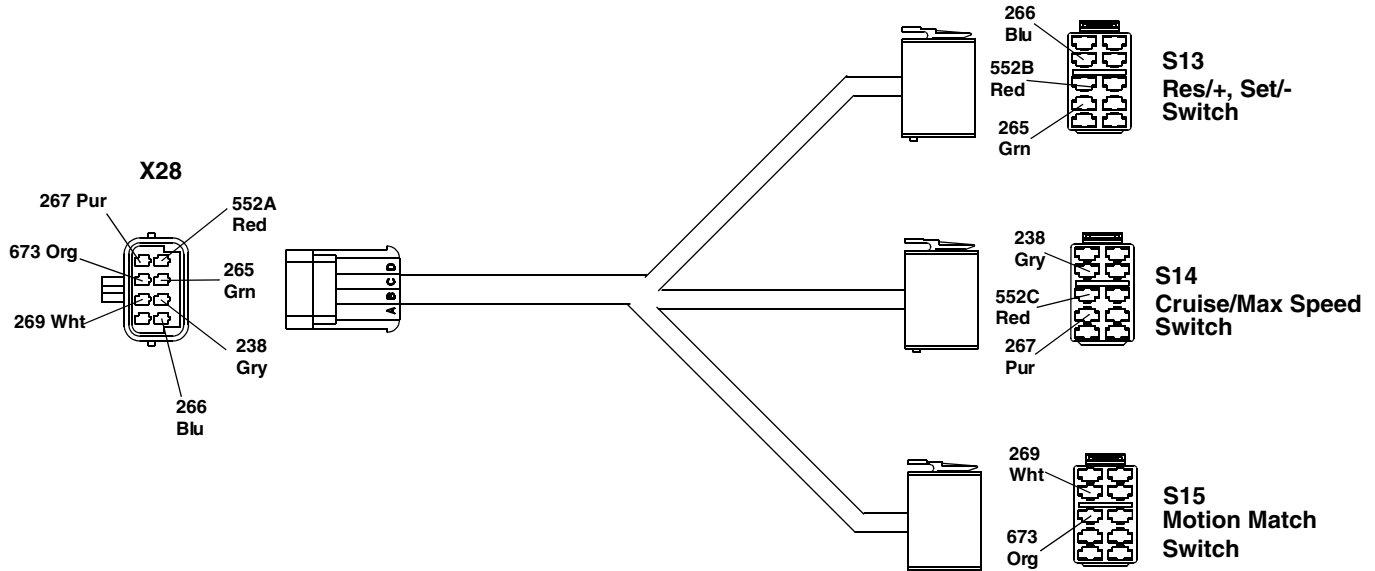
A—S14 Cruise/Max Speed
Switch
B—S13 Res/+, Set/- Switch

C—S15 Motion Match Switch
D—X28 W9 eHydro/Auto HST
Wiring Harness-to-W12
Cruise Control Wiring
Harness Connector



LVAL11572 —UN—02NOV10

KN52281,10043FA -19-04JAN13-1/2



S13— Res/+, Set/- Switch
S14— Cruise/Max Speed Switch
S15— Motion Match Switch
X28— W9 eHydro/Auto HST
Wiring Harness-to-W12
Cruise Control Wiring
Harness Connector

LVAL11573 —UN—02NOV10

KN52281,10043FA -19-04JAN13-2/2

**W12 eHydro™/Auto HST Cruise Control
Wiring Harness Color Codes (Optional)**

Size/No./Color	Wire Connection Points
0.8 238 Gry	X28, S14
0.8 265 Grn	X28, S13
0.8 266 Blu	X28, S13
0.8 267 Pur	X28, S14
0.8 269 Wht	X28, S15
0.8 552A Red	X28, Splice
0.8 552B Red	Splice, S13
0.8 552C Red	Splice, S14
0.8 673 Org	X28, S15

KN52281,10043FB -19-02NOV12-1/1

Power Circuit Operation—NA

Function:

To provide unswitched and switched power to the primary electrical components whenever the battery is properly connected.

The power circuits are divided among the unswitched power circuit, switched power circuits (key switch in run position), and secondary power circuits. The secondary power circuits become energized when switched power circuits energize relays and/or control modules, providing current paths to the secondary circuits. The secondary power circuits will not be energized if the relay or control module controlling the current path(s) malfunction.

Unswitched Power:

Voltage must be present at each of the following components with the key switch in the OFF position:

- G1 Battery positive terminal
- Y1 Starting motor solenoid (B terminal)
- G2 Alternator (terminal B)
- K3 Manifold Heater (terminal 30)
- F3 Fuse
- F5 Fuse
- S1 Key Switch (terminal 1)
- K1 Fuel Relay (terminal 30)
- S2 Light Switch (terminal B)
- S5 Turn Signal Switch (terminal 2) (Pre MY08)
- A1 Display Panel at X10 Connector (terminals D and H)

The positive battery cable connects the battery to the starting motor. The starting motor bolt is used as the 12 Volt DC tie point for the rest of the electrical system.

The battery cables and the starting motor tie point connections must be good for the machine electrical system to work properly. The ground cable and positive cable connections are equally important. Proper starting motor operation depends on these cables and connections to carry high current.

With the exception of the B terminal of the alternator, the electrical circuit is protected by either the F1 or F2 fusible links beyond the starting motor tie point. The fusible link is a short piece of wire that is designed to fail if current load is too high or a short occurs. Some of the unswitched power circuits are protected by F3 and F5 fuses as well.

Switched Power:

In addition to the voltage present at the locations of the unswitched power circuits, voltage must be present at the following components during the following conditions: key switch in the run position, transmission in neutral, PTO(s) off, park brake locked, MFWD disengaged, and operator off seat:

- S1 Key Switch (terminals 3 and 5)
- G2 Alternator (terminals IG and P) (if engine is running)

- G2 Alternator (072A Red wire)
- F7 Fuse
- F11 Fuse
- X4 Connector (terminal A)
- X57 Front Hitch Detection (MY13)
- B1 Air Filter Restriction Switch (terminal B)
- S3 Rear PTO Switch (terminals 1 and 7)
- S4 Display Mode Switch
- S5 Turn Signal Switch (terminal 2) (MY08)
- S6 Seat Switch
- S7 MFWD Engagement Sensing Switch
- S8 Park Brake Switch (terminals A)
- S9 Mid PTO Sensing Switch (optional)
- S10 Transmission Neutral Switch (PRT)
- S11 Rear PTO Sensing Switch
- M2 Fuel Pump
- A1 Display Panel at X7 Connector (terminals A and K)
- A1 Display Panel at X10 Connector (terminals A, B, and K)
- A1 Display Panel at X11 Connector (terminal D)

These circuits are controlled by the key switch and are protected by the F1 fusible link and the F7 fuse.

Switched Power—eHydro™/Auto HST Specific Circuits:

In addition to the main machine circuits, voltage must be present at several components of the eHydro™/Auto HST machine during the following conditions: load match, brake switch, motion match, cruise switch, and Res/+, Set/- switches in OFF position if equipped.

- X26 Connector (terminals A3)
- S17 Brake Switch (terminal B and D)
- S12 Load Match Switch (terminal 2) (optional, eHydro™ only)
- X28 Connector (terminal A)
- S16 Cruise Control Switch (terminals 2 and 5) (standard)
- S13 Res/+, Set/- Switch terminal 2 (optional)
- S14 Cruise/Max Speed Switch (terminal 2) (optional)
- S18 FNR Switch (Auto HST only)

These circuits are controlled by the key switch and are protected by the F1 fusible link and F7 and F11 fuses.

Secondary Switched Power:

Secondary switched voltage must be present at the following components during the following conditions: key switch in the run position, transmission in neutral, PTO(s) OFF, park brake locked, MFWD disengaged, and operator off seat:

- K1 Fuel Relay (terminals 86 and 87)
- Y2 Fuel Shutoff Pull-In Solenoid
- Y2 Fuel Shutoff Hold-In Solenoid (after a short delay)
- B3 Engine Coolant Temperature Sensor
- B4 Fuel Gauge Sensor

These circuits are controlled by the key switch and are protected by the F1 fusible link, F3 and the F7 fuses.

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KN52281,10043FC -19-09JAN13-1/2

Secondary Switched Power—eHydro™/Auto HST Specific Circuits:

In addition to the main machine circuits, voltage must be present at several components of the eHydro™/Auto HST machine. Those circuits that are outputs of the drive controller and should be at 5 volts during the following conditions: load match, brake switch, motion match, cruise switch, and Res/+, Set/- switches in OFF position if equipped.

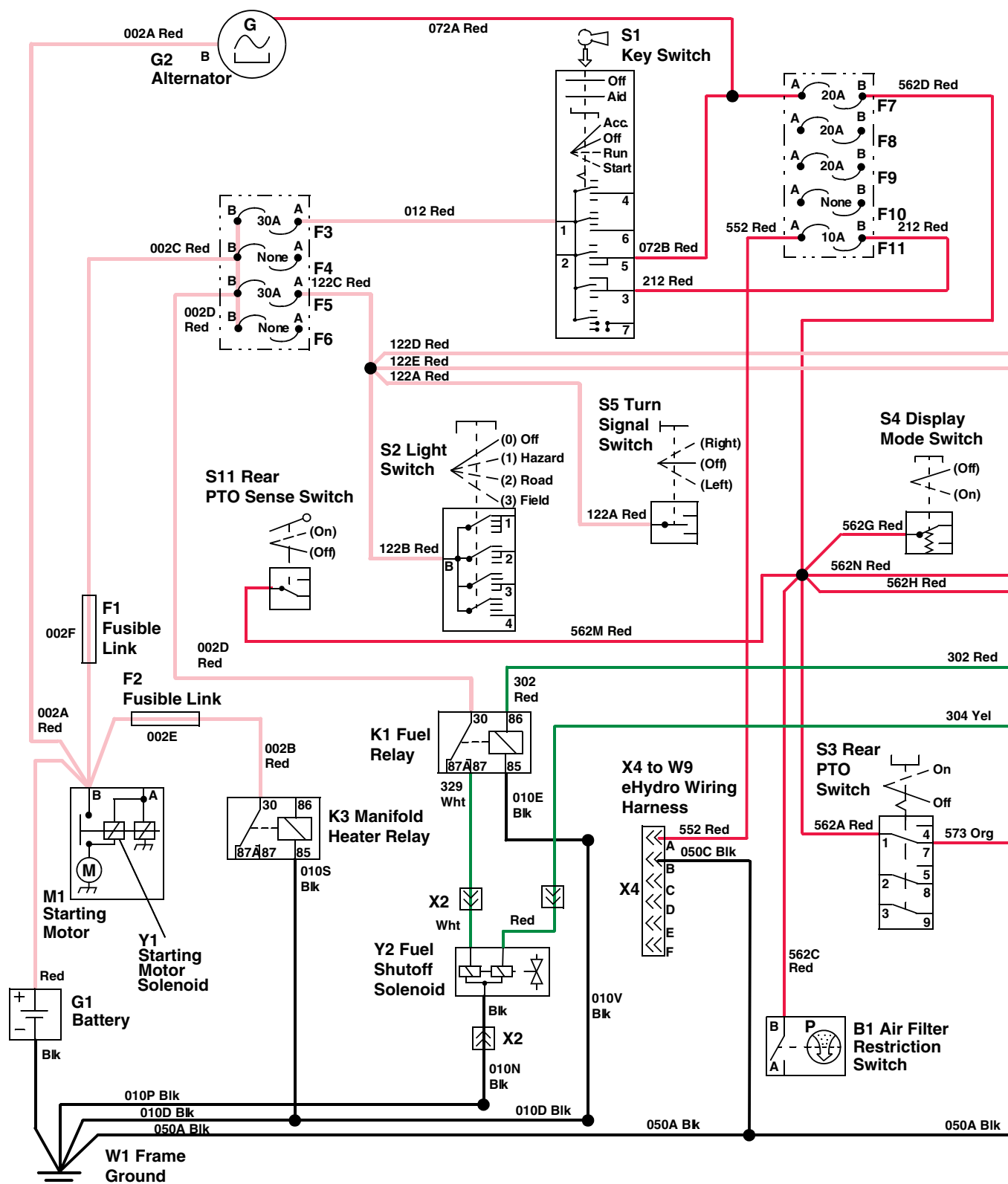
eHydro is a trademark of Deere & Company

- X26 Connector (terminal B1) (5 volts)
- S15 Motion Match Switch (terminal 5) (5 volts)
- T1 Forward Pedal Sensor (terminal C) (5 volts)
- T4 Reverse Pedal Sensor (terminal C) (5 volts) (eHydro™ only)
- T2 Throttle Position Sensor (terminal A) (5 volts)
- T3 MFWD Speed Sensor (terminal A) (5 volts)

These circuits are controlled by the key switch and are protected by the F1 fusible link and F7 and F11 fuses.

KN52281,10043FC -19-09JAN13-2/2

Power Circuit Electrical Schematic—W1 PRT and eHydro™—Pre MY08



LVAL11574 —UN—02NOV10

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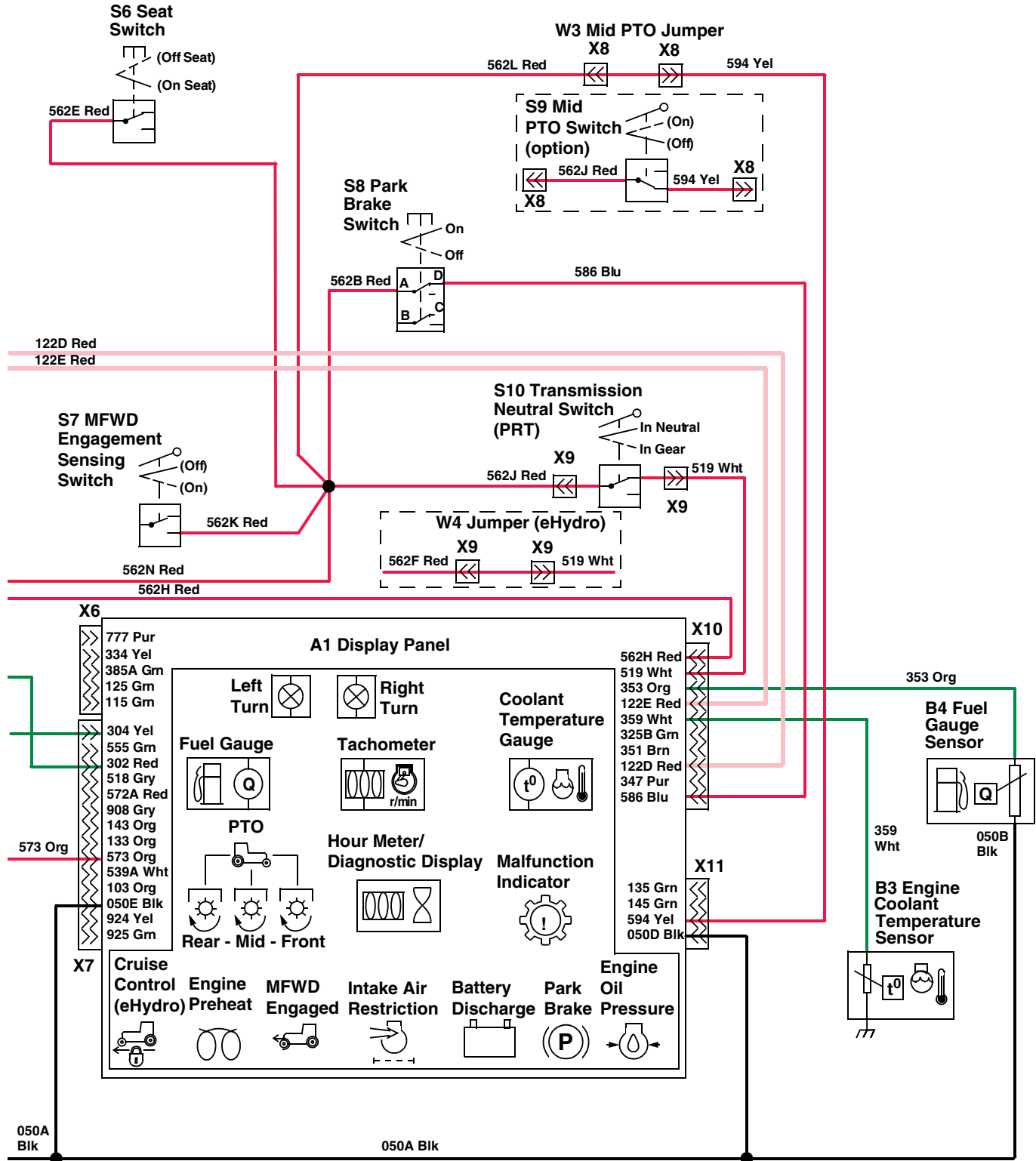
KN52281,10043FD -19-02NOV12-1/4

B1—Air Filter Restriction Switch	F10— Not Used	S4—Display Mode Switch	Y1—Starting Motor Solenoid
F1— Fusible Link	F11— Fuse 10A	S5— Turn Signal Switch	Y2— Fuel Shutoff Solenoid
F2— Fusible Link	G1—Battery	S11— Rear PTO Sense Switch	
F3— Fuse 30A	G2—Alternator	W1—Frame Ground	
F4— Not Used	K1—Fuel Relay	X2— W1 Main Wiring	
F5— Fuse 30A	K3—Manifold Heater Relay	Harness-to-Y2 Fuel Shutoff Solenoid	
F6— Not Used	M1—Starting Motor	X4— W1 Main Wiring	
F7— Fuse 20A	S1— Key Switch	Harness-to-W9 eHydro™	
F8— Fuse 20A	S2— Light Switch	Wiring Harness	
F9— Fuse 20A	S3— Rear PTO Switch		

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KN52281,10043FD -19-02NOV12-2/4



LVAL11575 —UN—02NOV10

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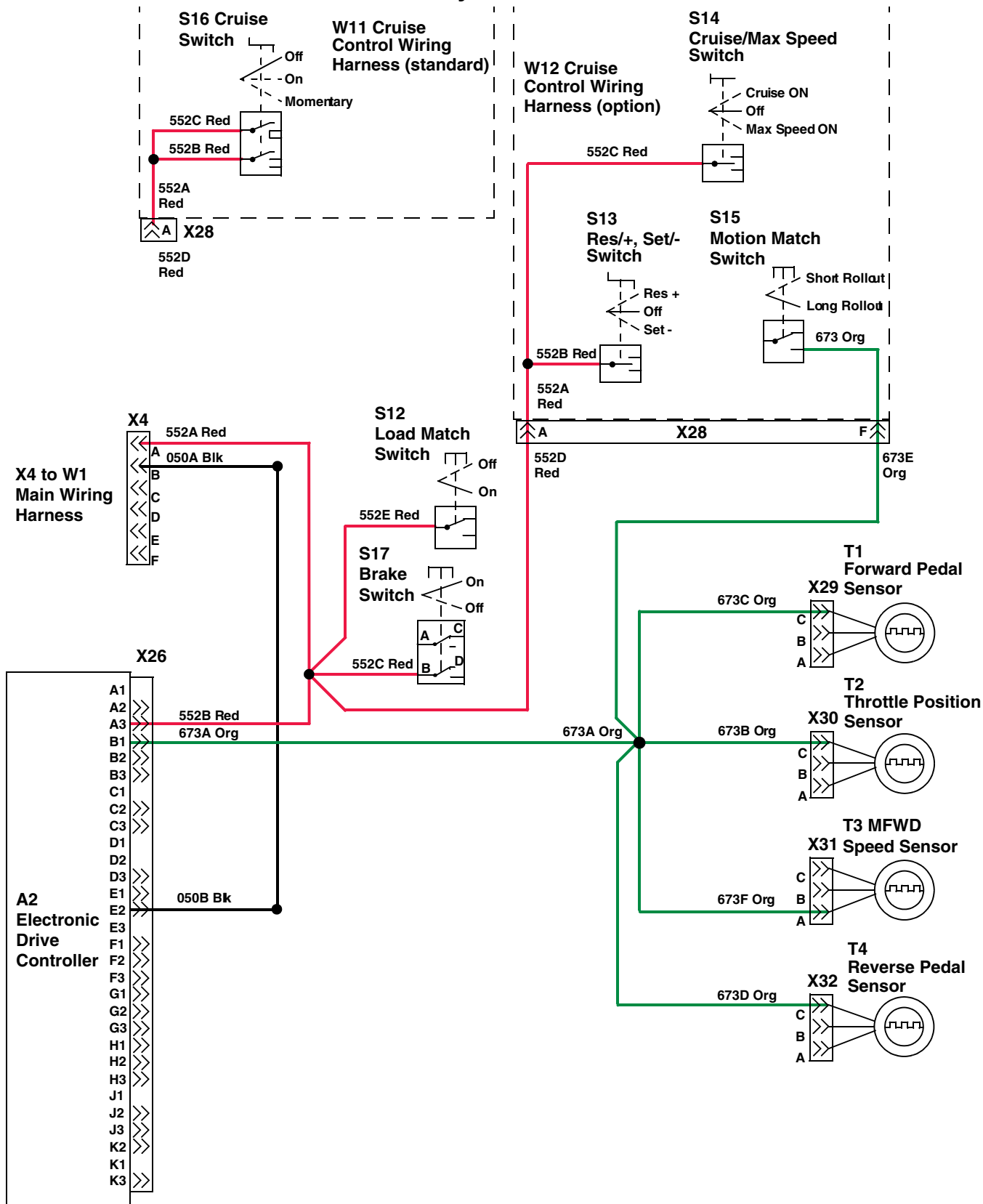
KN52281,10043FD -19-02NOV12-3/4

A1—Display Panel	S10— Transmission Neutral Switch (PRT)	X7—W1 Main Wiring Harness-to-A1 Display Panel	X10— W1 Main Wiring Harness-to-A1 Display Panel
B3—Engine Coolant Temperature Sensor	W3—Mid PTO Jumper (standard)	X8—W1 Main Wiring Harness to W3 Mid PTO Jumper Plug (standard), S9 Mid PTO Switch (optional)	X11— W1 Main Wiring Harness-to-A1 Display Panel
B4—Fuel Gauge Sensor	W4—Jumper (eHydro™)		
S6—Seat Switch	X6—W1 Main Wiring Harness-to-A1 Display Panel	X9—W1 Main Wiring Harness to S10 Transmission Neutral Switch (PRT), W4 Jumper Plug (eHydro™)	
S7—MFWD Engagement Sensing Switch			
S8—Park Brake Switch			
S9—Mid PTO Switch (optional)			

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KN52281,10043FD -19-02NOV12-4/4

Power Circuit Electrical Schematic—W9 eHydro™—Pre MY08



LVAL11576 —UN—02NOV10

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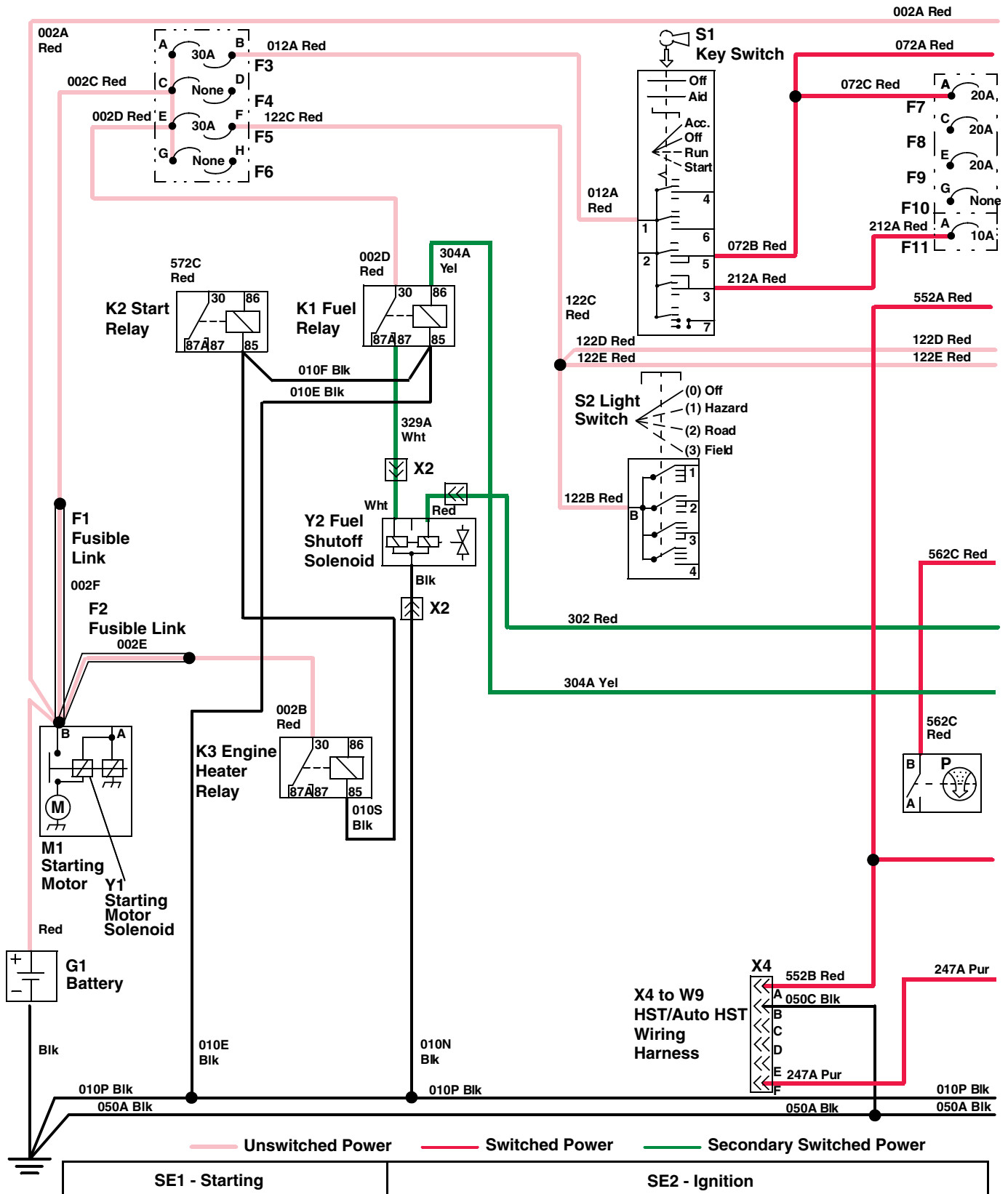
KN52281,10043FE -19-07JAN13-1/2

A2—Electronic Drive Controller	T2— Throttle Position Sensor	X26— W9 eHydro™ Wiring Harness-to-A2 Electronic Drive Controller	X30— W9 eHydro™ Wiring Harness-to-T2 Throttle Position Sensor
S12— Load Match Switch	T3— MFWD Speed Sensor	X28— W9 eHydro™ Wiring Harness-to-W11 Cruise Control Wiring Harness (standard), W12 Cruise Control Wiring Harness (optional)	X31— W9 eHydro™ Wiring Harness-to-T3 MFWD Speed Sensor X32 - W9
S13— Res/+, Set/- Switch (optional)	T4— Reverse Pedal Sensor	X29— W9 eHydro™ Wiring Harness-to-T1 Forward Pedal Sensor	X32— W9 eHydro™ Wiring Harness-to-T4 Reverse Pedal Sensor
S14— Cruise Control/Max Speed Switch (optional)	W11—Cruise Control Wiring Harness (standard)		
S15— Motion Match Switch (optional)	W12—Cruise Control Wiring Harness (optional)		
S16— Cruise Control Switch (standard)	X4— W1 Main Wiring Harness-to-W9 eHydro™ Wiring Harness		
S17— Brake Switch			
T1— Forward Pedal Sensor			

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KN52281,10043FE -19-07JAN13-2/2

Power Circuit Electrical Schematic—MY08



LVAL11577—UN—02NOV10

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KN52281,10043FF -19-02NOV12-1/6

F1— Fusible Link
F2— Fusible Link
F3— Fuse 30A
F4— Not Used
F5— Fuse 30A
F6— Not Used
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A

F10— Not Used
F11— Fuse 10A
G1—Battery
K1—Fuel Relay
K2—Start Relay
K3—Manifold Heater Relay
M1—Starting Motor
S1— Key Switch

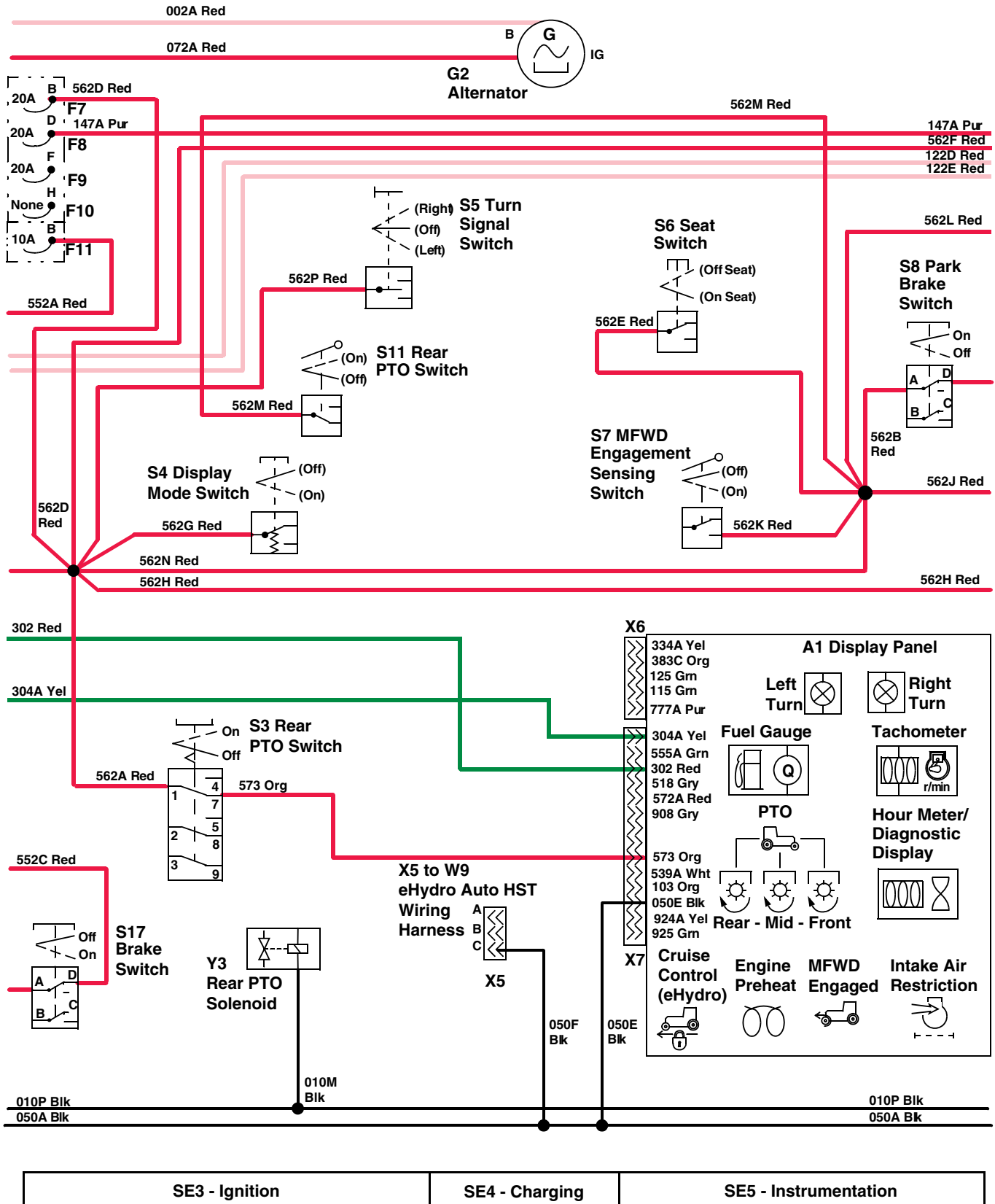
S2— Light Switch
SE1— Starting
SE2— Ignition
X2— W1 Main Wiring
Harness-to-Y2 Fuel Shutoff
Solenoid
X4— W1 Main Wiring
Harness-to-W9 eHydro™
Wiring Harness

Y1— Starting Motor Solenoid
Y2— Fuel Shutoff Solenoid

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KN52281,10043FF -19-02NOV12-2/6



LVAL11578 —UN—02NOV10

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KN52281,10043FF -19-02NOV12-3/6

A1—Display Panel
 F7— Fuse 20A
 F8— Fuse 20A
 F9— Fuse 20A
 F10— Not Used
 F11— Fuse 10A
 G2—Alternator
 S3—Rear PTO Switch
 S4—Display Mode Switch

S5— Turn Signal Switch
 S6— Seat Switch
 S7— MFWD Engagement Sensing
 Switch
 S8— Park Brake Switch
 S11— Rear PTO Sense Switch
 S17— Brake Switch

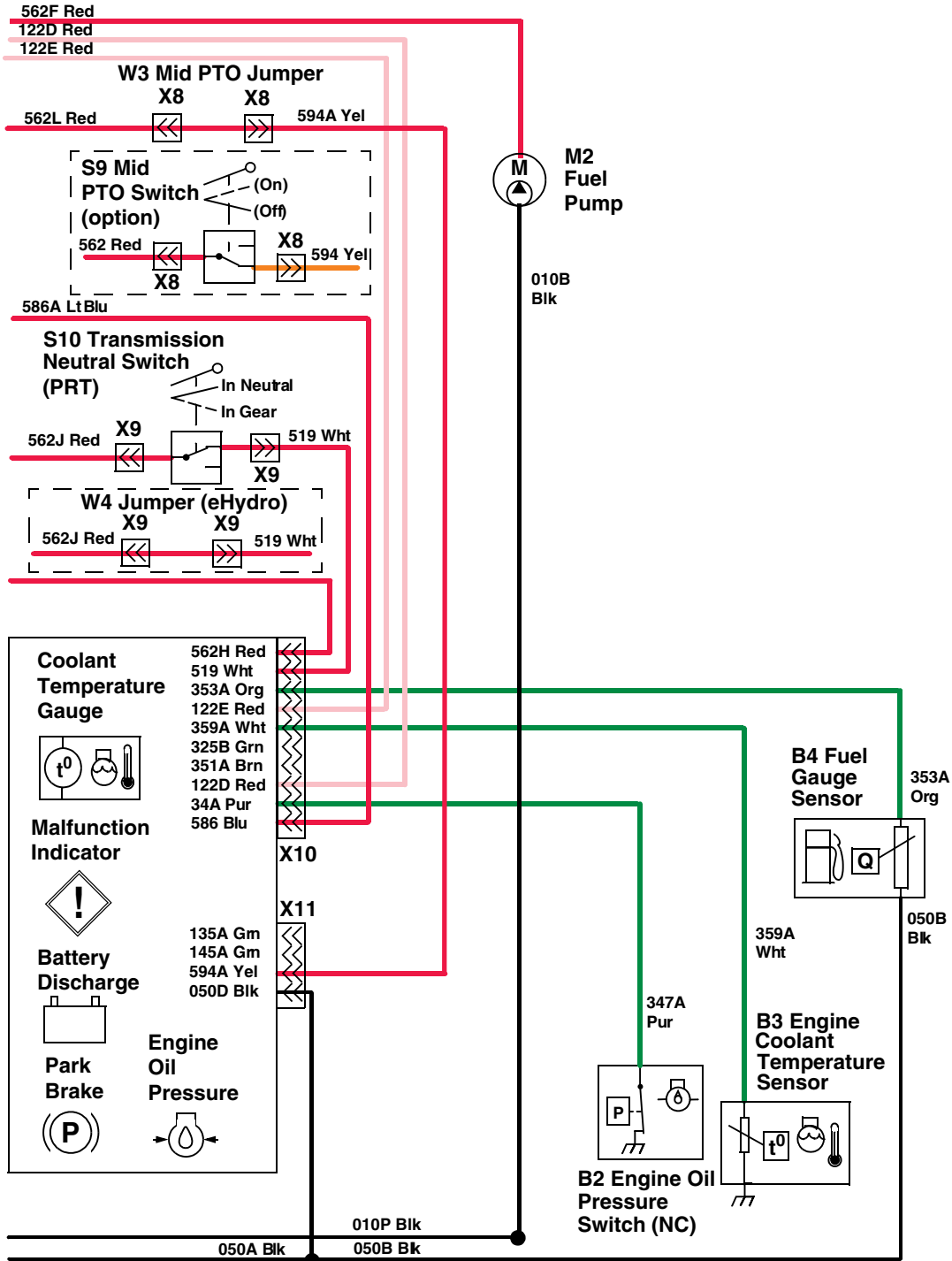
SE3— Ignition
 SE4— Charging
 SE5— Instrumentation
 X5— W1 Main Wiring
 Harness-to-W9 eHydro™
 Wiring Harness

X6— W1 Main Wiring
 Harness-to-A1 Display Panel
 X7— W1 Main Wiring
 Harness-to-A1 Display Panel
 Y3— Rear PTO Solenoid

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KN52281,10043FF -19-02NOV12-4/6



SE5 - Instrumentation

SE6 - Lights

LVAL11579—UN—02NOV10

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KN52281,10043FF -19-02NOV12-5/6

B2—Engine Oil Pressure Switch	SE5— Instrumentation	X9— W1 Main Wiring	X11— W1 Main Wiring
B3—Engine Coolant Temperature	SE6— Lights	Harness-to-S10	Harness-to-A1 Display
Sensor	W3—Mid PTO Jumper (standard)	Transmission Neutral	Panel
B4—Fuel Gauge Sensor	W4— W4 Jumper (eHydro™)	Switch (PRT), W4 Jumper	
M2—Fuel Pump	X8— W1 Main Wiring	Plug (eHydro™/Auto HST)	
S9—Mid PTO Switch (option)	Harness-to-W3 Jumper	X10— W1 Main Wiring	
S10— Transmission Neutral	Plug (standard), S9 Mid PTO	Harness-to-A1 Display	
Switch (PRT) (option)	Switch (option)	Panel	

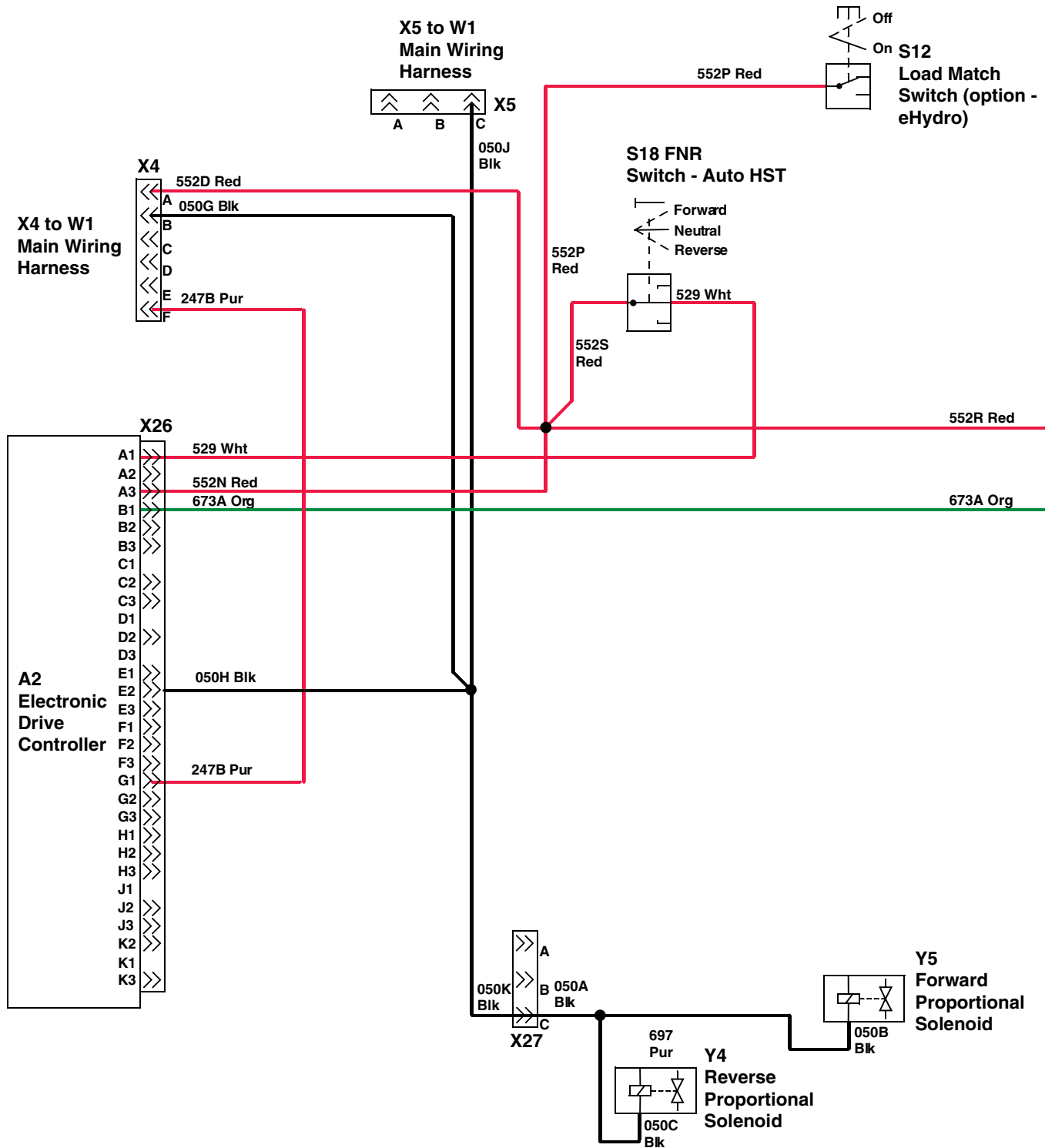
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KN52281,10043FF -19-02NOV12-6/6

Power Circuit Electrical Schematic—W9 eHydro™/Auto HST—MY08

Power Circuit Electrical Schematic and Cruise

Control—W9 eHydro™/Auto HST (1 of 2)



LVAL11560—UN—02NOV10

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KN52281,1004400 -19-07JAN13-1/4

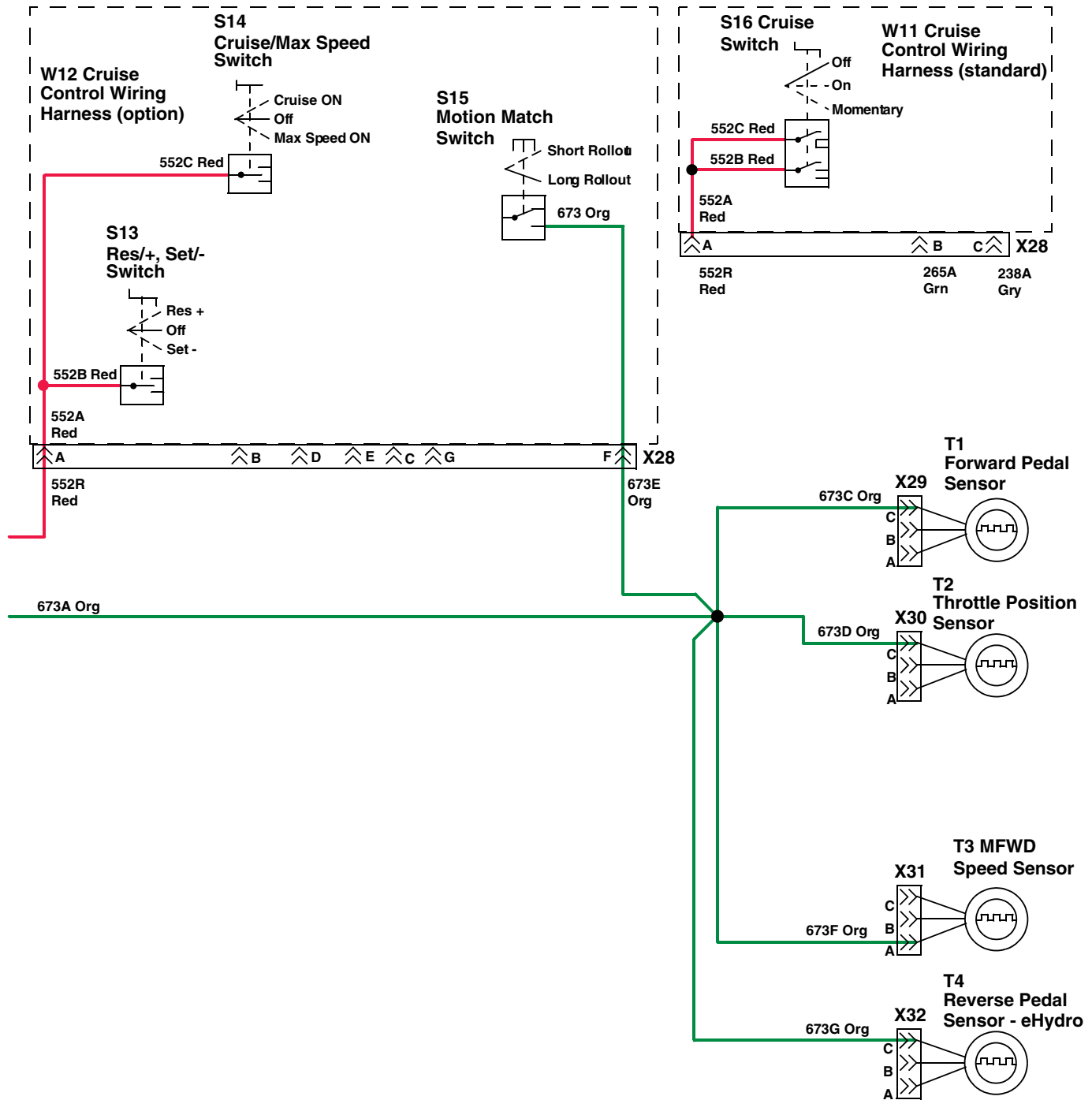
A2—Electronic Drive Controller	X4—W1 Main Wiring Harness-	X26— W9 eHydro™ Wiring	Y4—Reverse Proportional
S12— Load Match Switch	to-W9 eHydro™/Auto HST	Harness-to-A2 Electronic	Solenoid
(eHydro™)	Wiring Harness	Drive Controller	Y5—Forward Proportional
S18— FNR Switch (Auto HST)	X5—W1 Main Wiring	X27— W9 eHydro™ Wiring	Solenoid
	Harness-to-W9 eHydro™	Harness-to-W10	
	Wiring Harness	Proportional Valve Wiring	
		Harness	

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KN52281,1004400 -19-07JAN13-2/4

Power Circuit Electrical Schematic and Cruise Control—W9 eHydro™/Auto HST (2 of 2)



LVAL11581—UN—02NOV10

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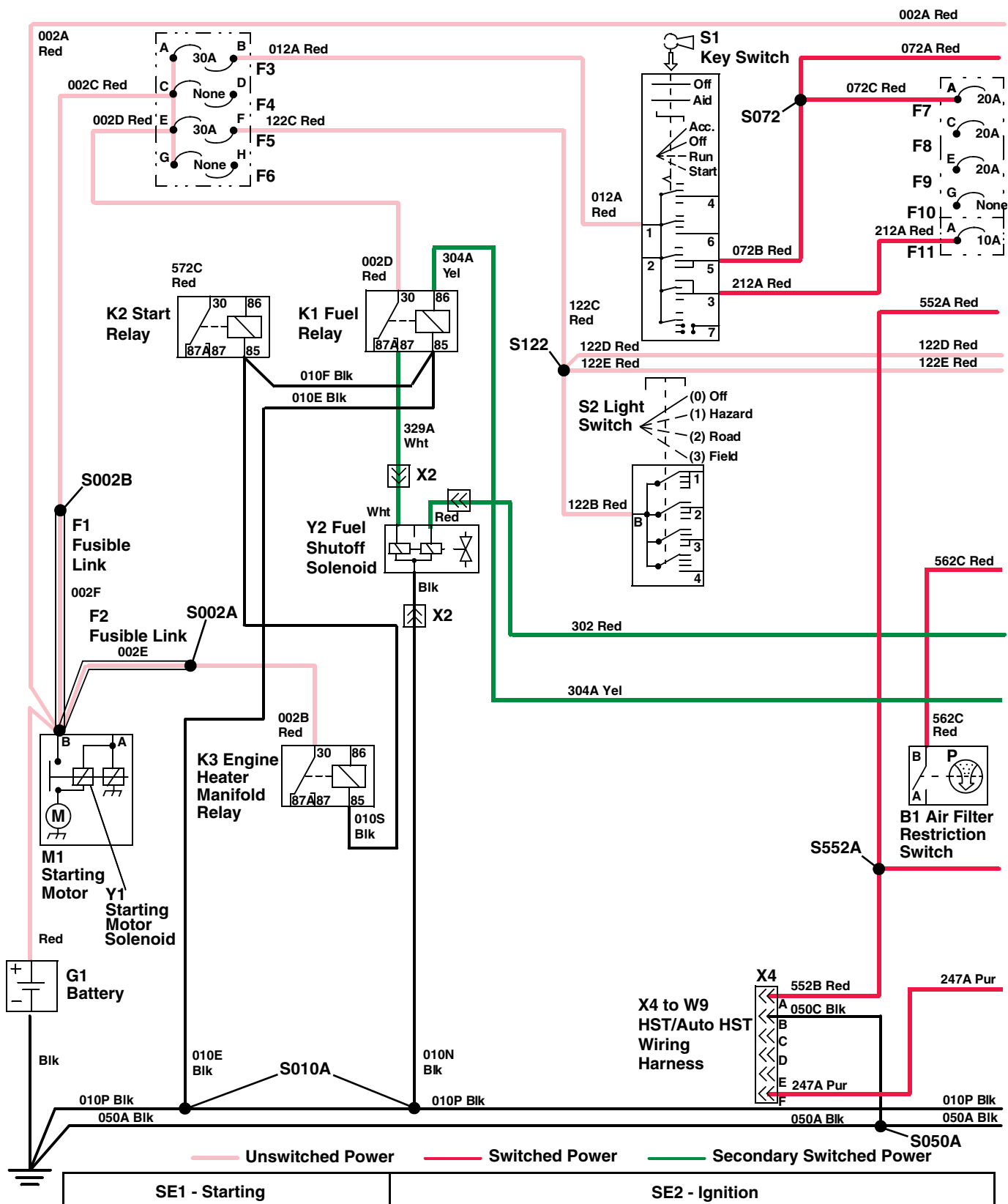
KN52281,1004400 -19-07JAN13-3/4

S13— Res/+, Set/- Switch (optional)	T3— MFWD Speed Sensor	X29— W9 eHydro™ Wiring Harness-to-T1 Forward Pedal Sensor
S14— Cruise Control/Max Speed Switch (optional)	T4— Reverse Pedal Sensor (eHydro™)	X30— W9 eHydro™ Wiring Harness-to-T2 Throttle Position Sensor
S15— Motion Match Switch (optional)	W11— Cruise Control Wiring Harness (standard)	X31— W9 eHydro™ Wiring Harness-to-T3 MFWD Speed Sensor
S16— Cruise Control Switch (standard)	W12— Cruise Control Wiring Harness (optional)	X32— W9 eHydro™ Wiring Harness-to-T4 Reverse Pedal Sensor (sensor installed on eHydro™)
T1— Forward Pedal Sensor	X28— W9 eHydro™ Wiring Harness-to-W11 Cruise Control Wiring Harness (standard), W12 Cruise Control Wiring Harness (optional)	
T2— Throttle Position Sensor		

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KN52281,1004400 -19-07JAN13-4/4

Power Circuit Electrical Schematic—MY13



Power Circuit Electrical Schematic—MY13 (1 of 3)

Continued on next page

KN52281,1004401 -19-09JAN13-1/6

F1— Fusible Link
F2— Fusible Link
F3— Fuse 30A
F4— Not Used
F5— Fuse 30A
F6— Not Used
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A
F10— Not Used

F11— Fuse 10A
G1—Battery
K1—Fuel Relay
K2—Start Relay
K3—Manifold Heater Relay
M1—Starting Motor
S1—Key Switch
S2—Light Switch

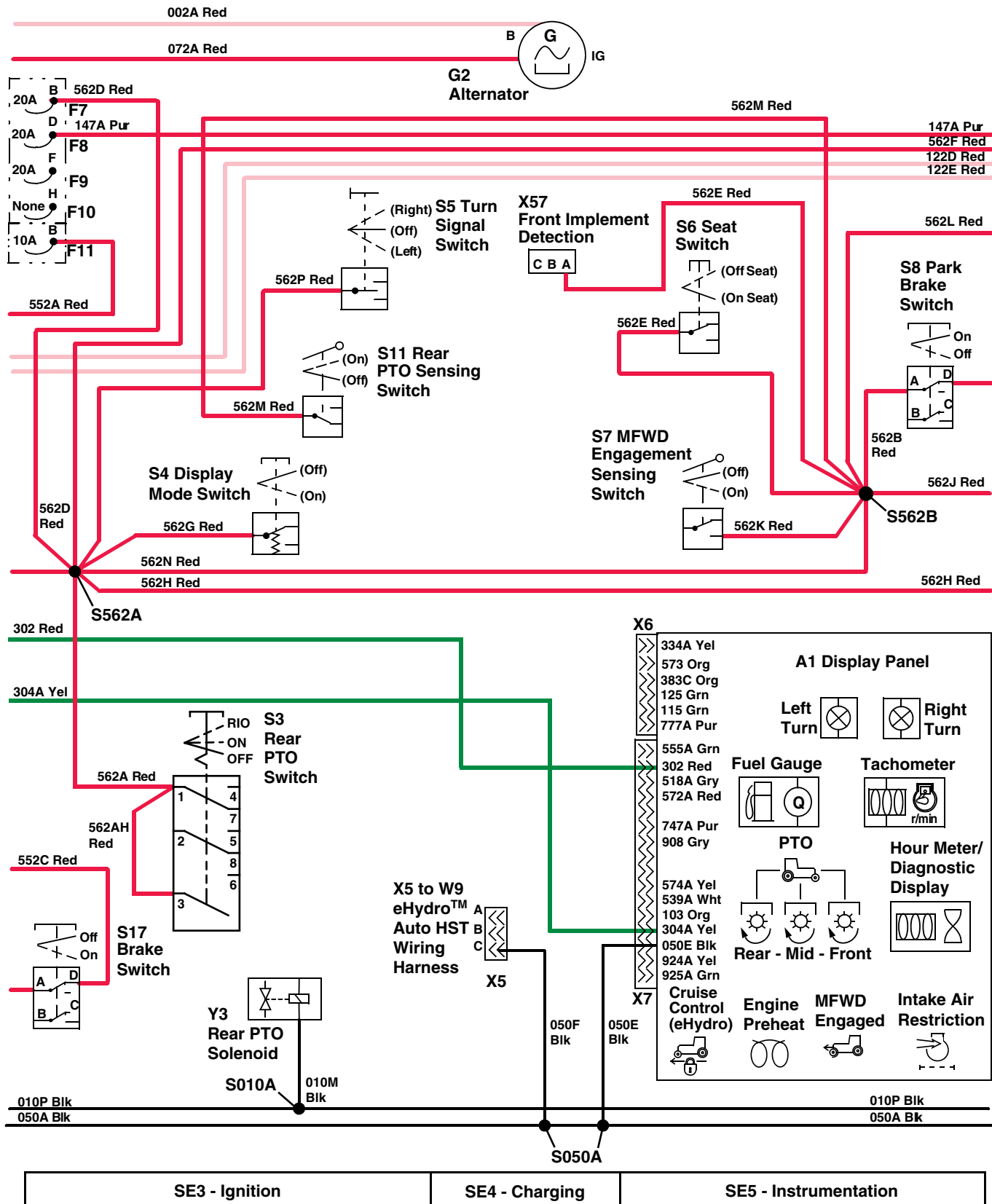
SE1— Starting
SE2— Ignition
X2—W1 Main Wiring
Harness-to-Y2 Fuel Shutoff
Solenoid
X4—W1 Main Wiring Harness-
to-W9 eHydro™/Auto HST
Wiring Harness

Y1— Starting Motor Solenoid
Y2— Fuel Shutoff Solenoid

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Continued on next page

KN52281,1004401 -19-09JAN13-2/6



Power Circuit Electrical Schematic—MY13 (2 of 3)

Continued on next page

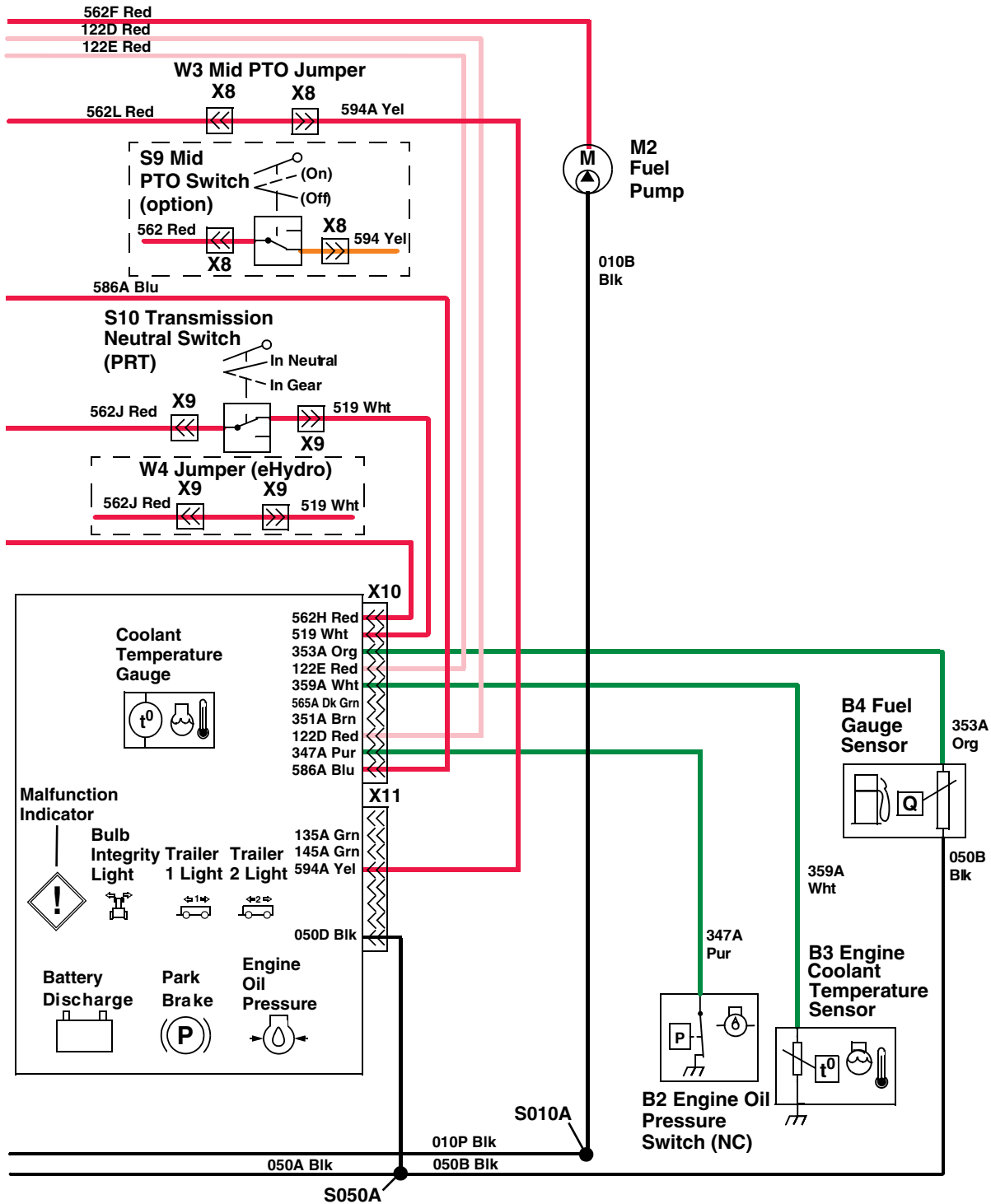
KN52281,1004401 -19-09JAN13-3/6

A1—Display Panel	S5—Turn Signal Switch	SE4—Charging	X7—W1 Main Wiring
F7—Fuse 20A	S6—Seat Switch	SE5—Instrumentation	Harness-to-A1 Display Panel
F8—Fuse 20A	S7—MFWD Engagement Sensing	X5—W1 Main Wiring Harness-	X57—Front Hitch Detection
F9—Fuse 20A	Switch	to-W9 eHydro™/Auto HST	Y3—Rear PTO Solenoid
F10—Not Used	S8—Park Brake Switch	Wiring Harness	
F11—Fuse 10A	S11—Rear PTO Sensing Switch	X6—W1 Main Wiring	
G2—Alternator	S17—Brake Switch	Harness-to-A1 Display Panel	
S3—Rear PTO Switch	SE3—Ignition		
S4—Display Mode Switch			

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Continued on next page

KN52281,1004401 -19-09JAN13-4/6



SE5 - Instrumentation

SE6 - Lights

Power Circuit Electrical Schematic—MY13 (3 of 3)

LVAL38721 —UN—05DEC12

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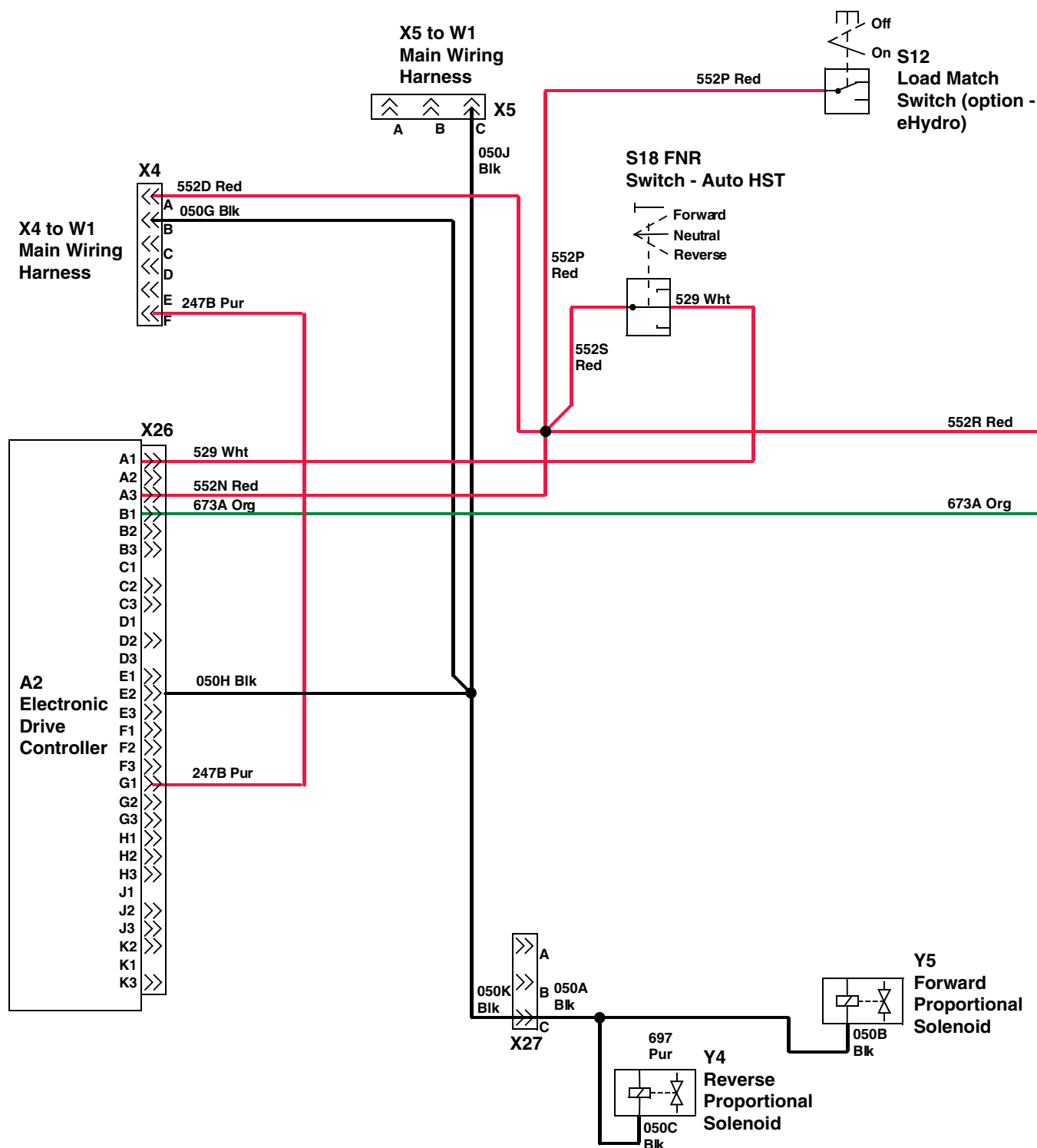
KN52281,1004401 -19-09JAN13-5/6

B2—Engine Oil Pressure Switch	SE5— Instrumentation	X9— W1 Main Wiring
B3—Engine Coolant Temperature Sensor	SE6— Lights	Harness-to-S10
B4—Fuel Gauge Sensor	W3—Mid PTO Jumper (standard)	Transmission Neutral
M2—Fuel Pump	W4— W4 Jumper (eHydro™)	Switch (PRT), W4 Jumper
S9—Mid PTO Sensing Switch (option)	X8— W1 Main Wiring	Plug (eHydro™/Auto HST)
S10— Transmission Neutral Switch (PRT) (option)	Harness-to-W3 Jumper Plug (standard), S9 Mid PTO Sensing Switch (option)	X10— W1 Main Wiring
		Harness-to-A1 Display Panel
		X11— W1 Main Wiring
		Harness-to-A1 Display Panel

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KN52281,1004401 -19-09JAN13-6/6

Power Circuit Electrical Schematic—W9 eHydro™/Auto HST—MY13



W9 eHydro™/Auto HST Power Circuit Schematic—MY13 (1 of 2)

Continued on next page

KN52281,1004402 -19-16JAN13-1/4

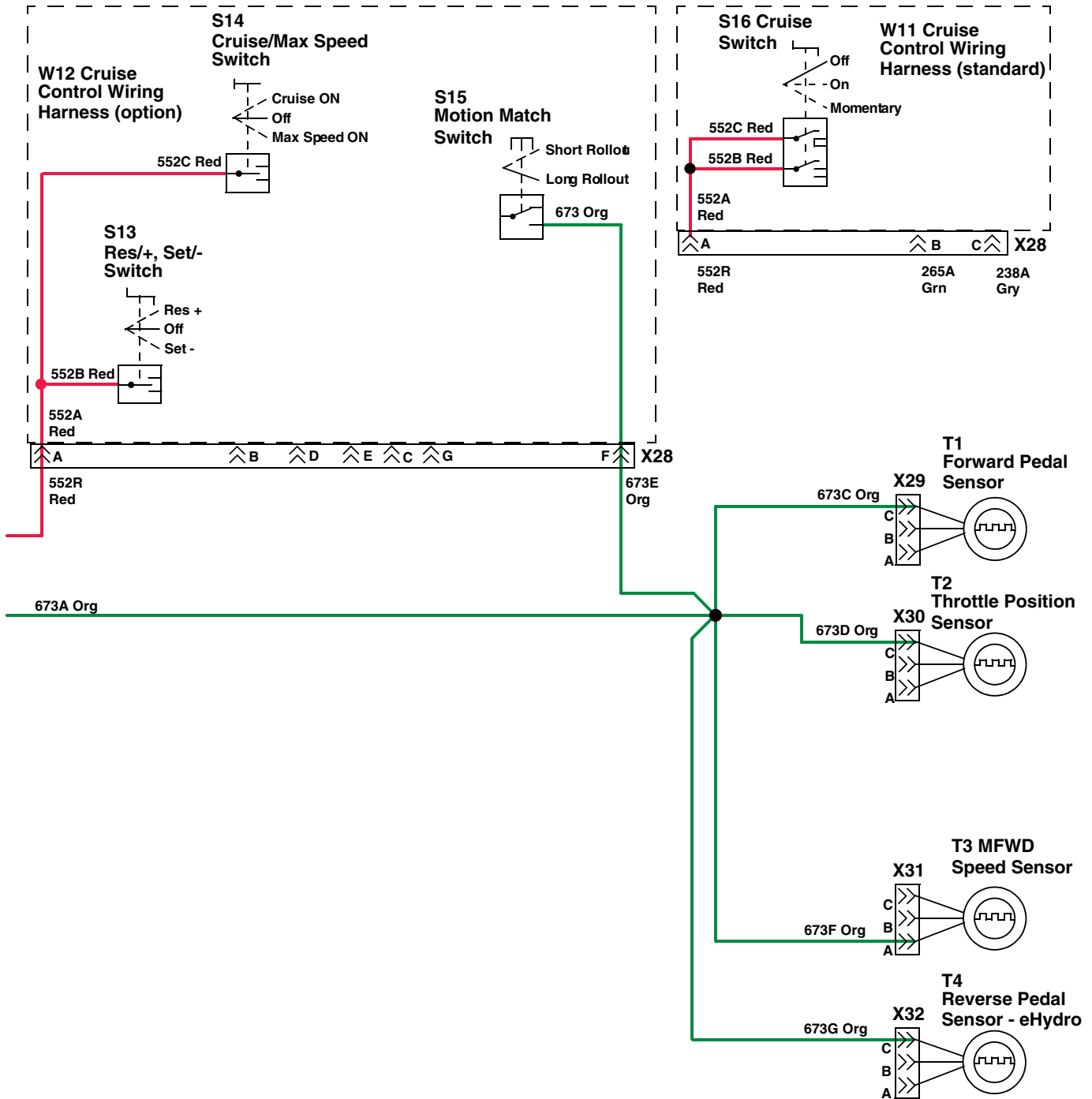
LVAL11580 —UN—02NOV10

A2—Electronic Drive Controller	X4—W1 Main Wiring Harness- to-W9 eHydro™/Auto HST	X27— W9 eHydro™/Auto HST Wiring Harness-to-W10 eHydro™/Auto HST Proportional Valve Wiring Harness	Y5—Forward Proportional Solenoid
S12— Load Match Switch (eHydro™)	X5—W1 Main Wiring Harness-to-W9 eHydro™ Wiring Harness	Y4—Reverse Proportional Solenoid	
S18— FNR Switch (Auto HST only)	X26— W9 eHydro™/Auto HST Wiring Harness-to-A2 Electronic Drive Controller		

eHydro is a trademark of Deere & Company

Continued on next page

KN52281,1004402 -19-16JAN13-2/4



W9 eHydro™/Auto HST Power Circuit Schematic—MY13 (2 of 2)

LVAL11581—UN—02NOV10

Continued on next page

KN52281,1004402 -19-16JAN13-3/4

S13— Res/+, Set/- Switch (optional)	T3— MFWD Speed Sensor	X29— W9 eHydro™/Auto HST Wiring Harness-to-T1 Forward Pedal Sensor
S14— Cruise Control/Max Speed Switch (optional)	T4— Reverse Pedal Sensor (eHydro™ only)	X30— W9 eHydro™/Auto HST Wiring Harness-to-T2 Throttle Position Sensor
S15— Motion Match Switch (optional)	W11— Cruise Control Wiring Harness (standard)	X31— W9 eHydro™/Auto HST Wiring Harness-to-T3 MFWD Speed Sensor
S16— Cruise Control Switch (standard)	W12—Cruise Control Wiring Harness (optional)	X32— W9 eHydro™ Wiring Harness-to-T4 Reverse Pedal Sensor (eHydro™ only)
T1— Forward Pedal Sensor	X28— W9 eHydro™/Auto HST Wiring Harness-to-W11 Cruise Control Wiring Harness (standard), W12 Cruise Control Wiring Harness (optional)	
T2— Throttle Position Sensor		

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KN52281,1004402 -19-16JAN13-4/4

Power Circuit Diagnosis—NA

- Key switch in OFF position.

Test Procedure A

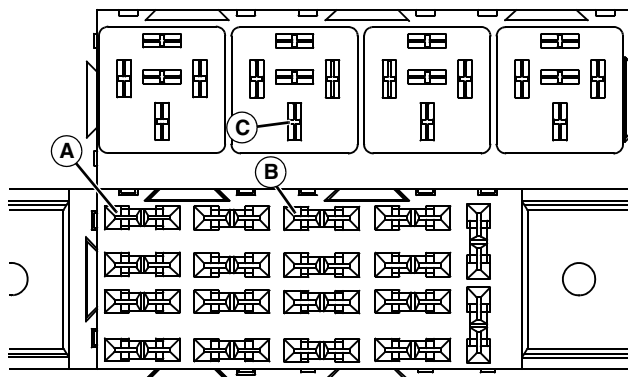
Test Conditions:

KN52281,1004403 -19-07JAN13-1/33

Unswitched Power Circuits

KN52281,1004403 -19-07JAN13-2/33

Step 1



LVAL11582 —UN—02NOV10

- A—Fuse F3 002C, Red Wire
- B—Fuse F5 002D, Red Wire
- C—Relay K1 002D, Red Wire

Remove F3 and F5 fuses. Is battery voltage present at F3 and F5 fuses, 002C (A) and 002D (B) Red wires?

YES: Install F3 and F5 fuses. Go to next step.

NO: Check F1 fusible link. Test battery. Check 002E and 002C Red wires and connections.

KN52281,1004403 -19-07JAN13-3/33

Step 2

Remove K1 fuel relay. Is battery voltage present at K1 fuel relay terminal 30, 002D Red wire (C)?

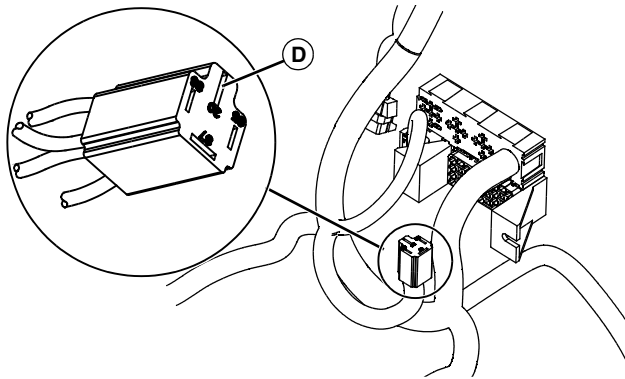
YES: Install K1 fuel relay. Go to next step.

NO: Check F1 fusible link. Test battery. Check 002E, 002C, and 002D Red wires and connections.

Continued on next page

KN52281,1004403 -19-07JAN13-4/33

Step 3



LVAL11583 —UN—02NOV10

D—K3 Manifold Heater Relay, 002B Red Wire

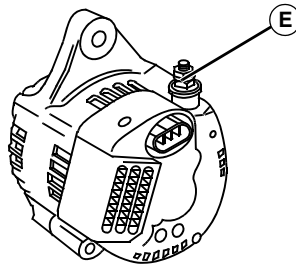
Remove K3 manifold heater relay. Is battery voltage present at K3 manifold heater relay terminal 30, 002B Red wire (D)?

YES: Install K3 manifold heater relay. Go to next step.

NO: Check F2 fusible link. Test battery. Check 002E and 002B Red wires and connections.

KN52281,1004403 -19-07JAN13-5/33

Step 4



LVAL11584 —UN—02NOV10

E—G2 Alternator Terminal B, 002A Red Wire

Is battery voltage present at G2 alternator terminal B, 002A Red wire (E)?

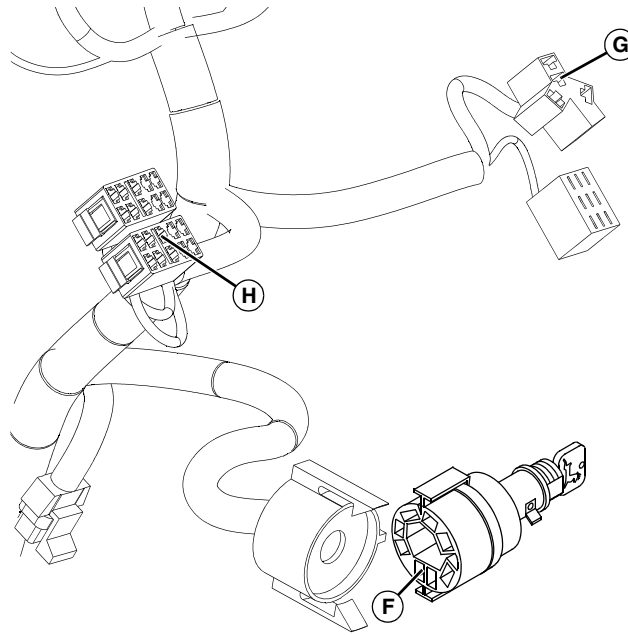
YES: Go to next step.

NO: Test battery. Check 002A Red wire and connections.

Continued on next page

KN52281,1004403 -19-07JAN13-6/33

Step 5



LVAL11585—UN—02NOV10

F—S1 Key Switch Terminal 1, 012 Red Wire

G—S1 Key Switch Terminal B, 122B Red Wire

H—S1 Key Switch Terminal 2, 122A Red Wire

Is battery voltage present at S1 key switch terminal 1, 012 Red wire (F)?

YES: Go to next step.

NO: Check F3 fuse.
Check 012 Red wire and connections.

KN52281,1004403 -19-07JAN13-7/33

Step 6

Is battery voltage present at S2 light switch terminal B, 122B Red wire (G)?

YES: Go to next step.

NO: Check F5 fuse. Check 122C and 122B Red wires and connections.

KN52281,1004403 -19-07JAN13-8/33

Step 7

Is battery voltage present at S5 turn signal switch terminal 2, 122A Red wire (H)?

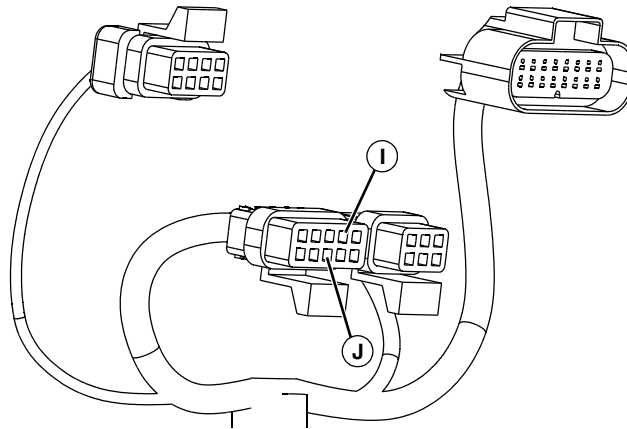
YES: Go to next step.

NO: Check F5 fuse. Check 122C and 122A Red wires and connections.

Continued on next page

KN52281,1004403 -19-07JAN13-9/33

Step 8



LVAL11586—UN—02NOV10

I— X10 Connector Terminal D, 122E Red Wire

J— X10 Connector Terminal H, 122D Red Wire

Disconnect the X10 connector. Is battery voltage present at A1 display panel X10 connector terminal D (I) and H (J), 122E and 122D Red wires?

YES: Connect the X10 connector. Unswitched power circuit is OK, test switched power circuits.

NO: Check F5 fuse. Check 122C, 122E and 122D Red wires and connections.

KN52281,1004403 -19-07JAN13-10/33

Test Procedure B

Test Conditions:

- Key switch in RUN position, engine off.
- Transmission in neutral (PRT).
- PTO(s) off.

- Park brake locked.
- MFWD disengaged.
- Operator off seat.
- Light switch OFF.
- Turn signal switch OFF.

KN52281,1004403 -19-07JAN13-11/33

Switched Power Circuits

KN52281,1004403 -19-07JAN13-12/33

Step 1

Does display panel complete self test?

Do gauges on display panel sweep to full right pin then back to left to required position? Example; fuel gauge at half full mark.

Do all the indicator lights illuminate for 1 to 2 seconds?

Do the battery discharge and park brake lights remain illuminated? Is the engine oil pressure indicator light flashing?

Do all the segments of the LCD display illuminate for 1 to 2 seconds and then display the hours of operation?

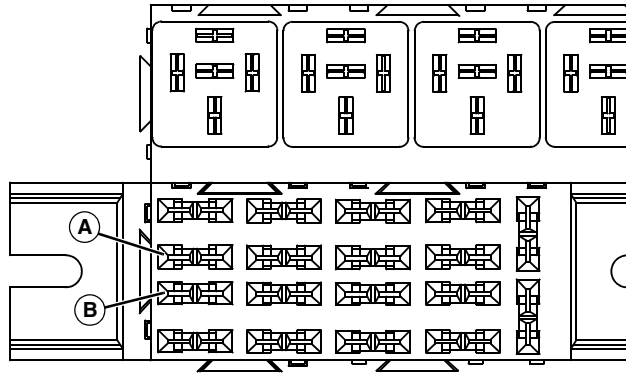
YES: Display panel is operational. Switched power circuit is functional. Go to next step.

NO: Check test conditions. Repeat test. Check unswitched power circuits. If OK, check individual circuits.

Continued on next page

KN52281,1004403 -19-07JAN13-13/33

Step 2



LVAL11587 —UN—02NOV10

A—Fuse F7, 072C Red Wire

B—Fuse F11, 212B Red Wire

Remove F7 and F11 fuses. Are fuses OK? Is battery voltage present at F7 and F11 fuses, 072C (A) and 212 (B) Red wires?

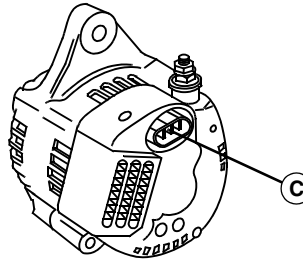
YES: Install F7 and F11 fuses. Go to next step.

NO: Replace fuse(s).

NO: Test key switch.
Check 072B, 072C and 212 Red wires and connections.

KN52281,1004403 -19-07JAN13-14/33

Step 3



LVAL11588 —UN—02NOV10

C—G2 Alternator Terminal, 072A Red Wire

Is battery voltage present at G2 alternator, 072A Red wire (C)?

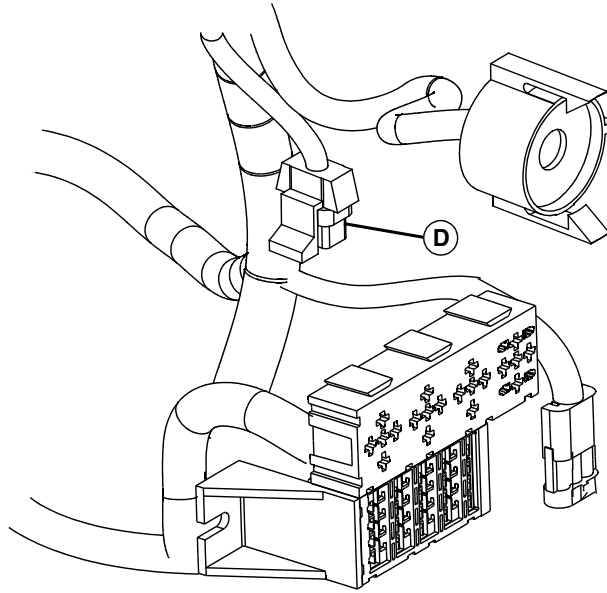
YES: Go to next step.

NO: Check 072B and 072A Red wires and connections.

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KN52281,1004403 -19-07JAN13-15/33

Step 4



I VAL 11589 —UN—02NOV10

D—X4 Connector Terminal A, 552 Red Wire

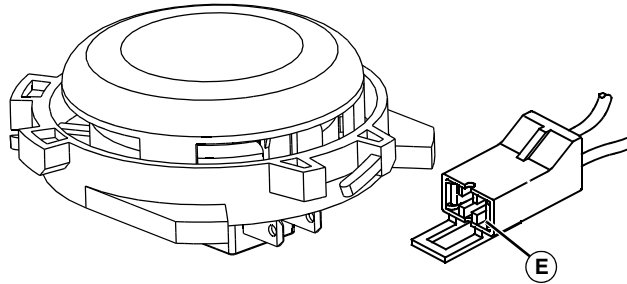
Disconnect X4 connector (D). Is battery voltage present at terminal A 552 Red wire?

YES: Connect the X4 connector. Go to next step.

NO: Check the F11 fuse. Check the 552 series Red wires.

KN52281,1004403 -19-07JAN13-16/33

Step 5



I VAL 11590 —UN—02NOV10

E—S6 Seat Switch, 562E Red Wire

Is battery voltage present at the S6 seat switch, 562E Red wire (E)?

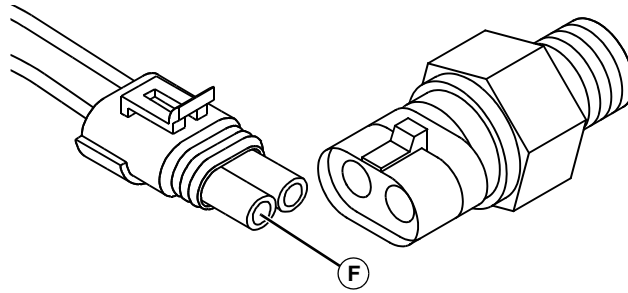
YES: Go to next step.

NO: Check the F7 fuse. Check the 562L, 562N and 562D Red wires. Test unswitched power circuit.

Continued on next page

KN52281,1004403 -19-07JAN13-17/33

Step 6



LVAL11591—UN—02NOV10

F—S7 MFWD Connector, 562K Red Wire

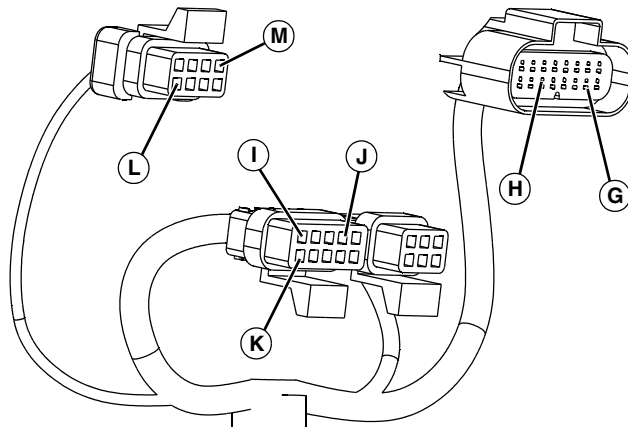
Is battery voltage present at the S7 MFWD engagement sensing switch, 562K Red wire (F)?

YES: Go to next step.

NO: Check the F7 fuse. Check the 562D, 562N and 562K Red wires. Test unswitched power circuit.

KN52281,1004403 -19-07JAN13-18/33

Step 7



LVAL11592—UN—02NOV10

G—X7 Display Panel Connector, Terminal K 573 Org Wire

H—X7 Display Panel Connector, Terminal P 050E Blk Wire

I—X10 Connector Terminal A, 562H Red Wire

J—X10 Connector Terminal B, 519 Wht Wire

K—X10 Connector Terminal K, 586 Blu Wire

L—X11 Connector Terminal D, 594 Yel Wire

M—X11 Connector Terminal H, 050D Blk Wire

Disconnect the X7 connector to the display panel. Is battery voltage present at A1 display panel X7 connector terminal K 573 Org wire (G)?

YES: Go to next step.

NO: No voltage present at 573 Org wire and 562H Red wire. Test rear PTO switch. Check 573 Org wire and connections. Test unswitched power circuit.

KN52281,1004403 -19-07JAN13-19/33

Step 8

Is continuity to ground present at X7 connector terminal P, 050E Blk wire (H)?

YES: Connect X7 connector. Go to next step.

NO: Check 050E and 050A Blk wires and connections.

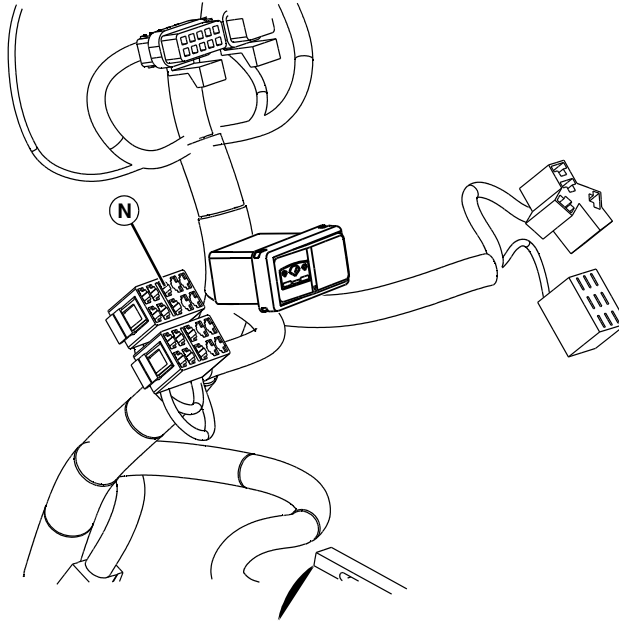
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KN52281,1004403 -19-07JAN13-20/33

<p>Step 9</p>	<p>Disconnect X10 connector to the display panel. Is battery voltage present at terminals A, 562H Red (I), B, 519 Wht (J), D, 594 Yel (L), and K, 586 Blu (K) wires?</p>	<p>YES: Connect X10 connector. Go to next step.</p> <p>NO: No voltage present at 562H Red wire. Test unswitched power circuit.</p> <p>NO: No voltage present at 519 Wht wire. Test transmission neutral switch (PRT). Check 519 Wht wire and connections. Test unswitched power circuit.</p> <p>NO: No voltage present at 586 Blu wire. Test park brake switch. Check 586 Blu wire and connections. Test unswitched power circuit.</p> <p>KN52281,1004403 -19-07JAN13-21/33</p>
<p>Step 10</p>	<p>Disconnect X11 connector to the display panel. Is battery voltage present at terminals D, 594 Yel (L) wire?</p>	<p>YES: Go to next step.</p> <p>NO: No voltage present at 594 Yel wire. Test mid PTO switch (if installed). Check 594 Yel wire and 562J Red wire and connections. Test unswitched power circuit.</p> <p>KN52281,1004403 -19-07JAN13-22/33</p>
<p>Step 11</p>	<p>Is continuity to ground present at terminal H, 050D Blk wire (M)?</p>	<p>YES: Connect X11 connector. Go to next step.</p> <p>NO: Check 050D and 050A Blk wires and connections.</p> <p>KN52281,1004403 -19-07JAN13-23/33</p>

Continued on next page

Step 12



LVAL11593 —UN—02NOV10

N—S4 Display Module Switch, 562G Wire

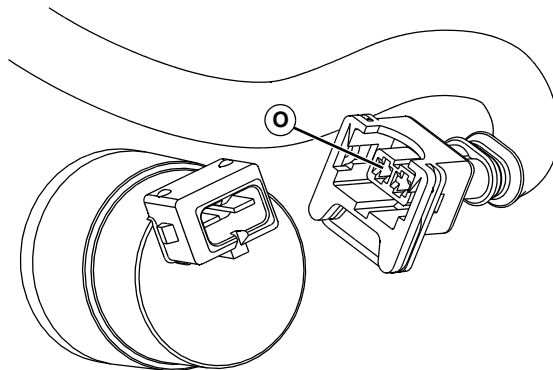
Disconnect the display mode switch. Is battery voltage present at S4 display mode switch connector 562G Red wire (N)?

YES: Connect display mode switch. Go to next step.

NO: Check the F7 fuse. Check the 562D and 562G Red wires. Test unswitched power circuit.

KN52281,1004403 -19-07JAN13-24/33

Step 13



LVAL11594 —UN—02NOV10

O—B1 Air Filter Restriction Switch, 562C Red Wire

Disconnect the air filter restriction switch. Is battery voltage present at B1 air filter restriction switch connector 562C Red wire (O)?

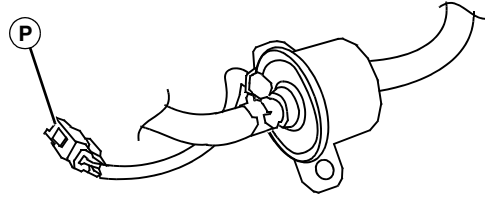
YES: Connect the air filter restriction switch. Go to next step.

NO: Check the F7 fuse. Check the 562 series Red wires. Test unswitched power circuit.

Continued on next page

KN52281,1004403 -19-07JAN13-25/33

Step 14



I VAL 11595 — UN — 02 NOV 10

P—M2 Fuel Pump, 562F Red Wire

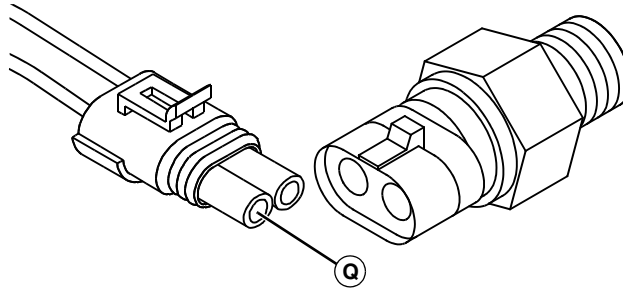
Is battery voltage present at 562F Red wire (P) of M2 fuel pump?

YES: Test complete.

NO: Check 562 series Red wires and connections.

KN52281,1004403 -19-07JAN13-26/33

Step 15



I VAL 11596 — UN — 02 NOV 10

Q—S10 MFWD Engagement Sensing Switch, 562K Red Wire

Is battery voltage present at the S10 MFWD engagement sensing switch, 562K Red wire (Q)?

YES: Go to next step.

NO: Check the F7 fuse. Check the 562K, 562N and 562D Red wires. Test unswitched power circuit.

KN52281,1004403 -19-07JAN13-27/33

Test Procedure C

Test Conditions:

- Key switch in the RUN position, engine off.
- Transmission in neutral (PRT).
- PTO(s) off.
- Park brake locked.
- MFWD disengaged.
- Operator off seat.
- Light switch OFF.
- Turn signal switch OFF.

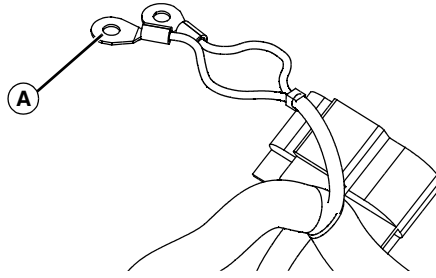
KN52281,1004403 -19-07JAN13-28/33

Secondary Switched Power Circuits

Continued on next page

KN52281,1004403 -19-07JAN13-29/33

Step 1



LVAL11597—UN—02NOV10

A—B4 Fuel Gauge Sensor, 353 Org Wire

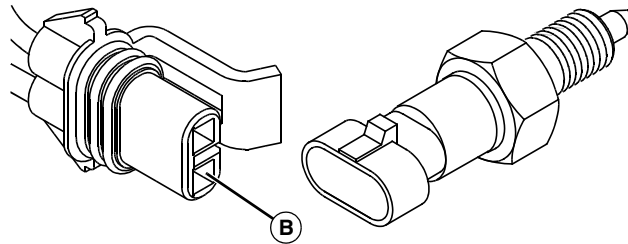
Is battery voltage present at B4 fuel gauge sensor, 353 Org wire (A)?

YES: Go to next step.

NO: Check 353 Org wire and connections. If OK, and test conditions are correct, replace display panel.

KN52281,1004403 -19-07JAN13-30/33

Step 2



LVAL11598—UN—02NOV10

B—B3 Engine Coolant Temperature Sensor, 359 Wht Wire

Is battery voltage present at B3 engine coolant temperature sensor, 359 Wht wire (B)?

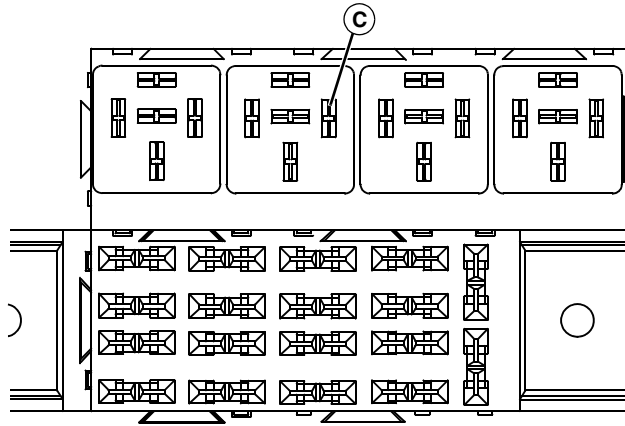
YES: Go to next step.

NO: Check 359 Wht wire and connections. If OK, and test conditions are correct, replace display panel.

Continued on next page

KN52281,1004403 -19-07JAN13-31/33

Step 3



LVAL11599—UN—02NOV10

C—K1 Fuel Relay Terminal 86, 304 Red Wire

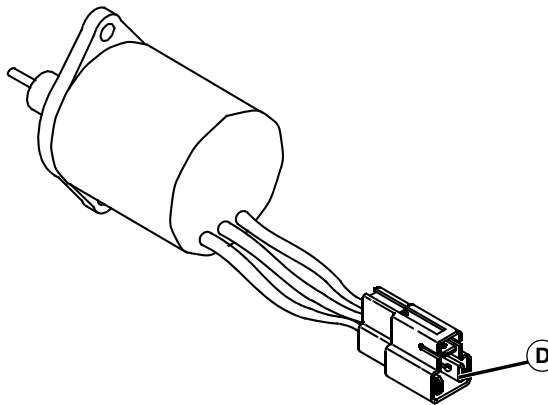
Remove K1 fuel relay. Is battery voltage present at K1 fuel relay terminal 86, 304 Red wire (C)?

YES: Install fuel relay.

NO: Check that test conditions are met. Check 304 Red wire and connections. If OK, replace display panel.

KN52281,1004403 -19-07JAN13-32/33

Step 4



LVAL11600—UN—02NOV10

D—Y2 Fuel Shutoff Solenoid, 302 Red Wire

Is battery voltage present at Y2 fuel shutoff solenoid, 302 Red wire (D)?

YES: Test complete.

NO: Check that test conditions are met. Check 302 Red wire and connections. If OK, replace display panel.

KN52281,1004403 -19-07JAN13-33/33

Power Circuit Diagnosis—MY13

Test Procedure A

Test Conditions

- Key switch in OFF position.

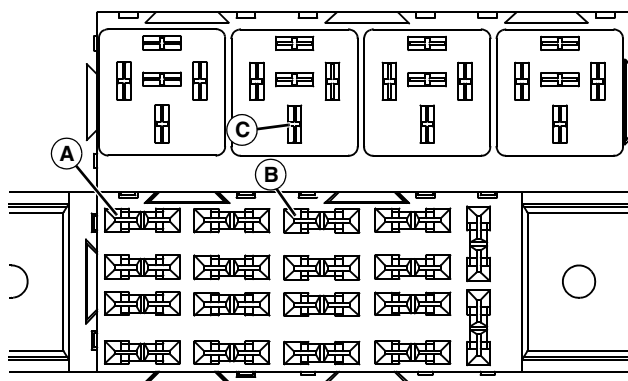
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KN52281,1004404 -19-21JAN13-1/31

Unswitched Power Circuits

KN52281,1004404 -19-21JAN13-2/31

Step 1



LVAL11582 —UN—02NOV10

A—Fuse F3 002C, Red Wire
B—Fuse F5 002D, Red Wire
C—Relay K1 002D, Red Wire

Remove F3 and F5 fuses. Is battery voltage present at F3 and F5 fuses, 002C (A) and 002D (B) Red wires?

YES: Install F3 and F5 fuses. Go to next step.

NO: Check F1 fusible link. Test battery. Check 002E and 002C Red wires and connections.

KN52281,1004404 -19-21JAN13-3/31

Step 2

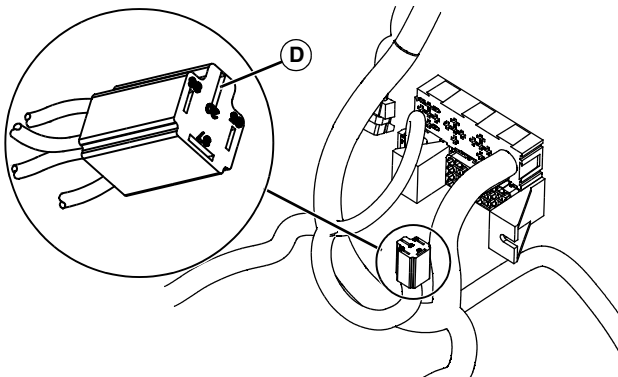
Remove K1 fuel relay. Is battery voltage present at K1 fuel relay terminal 30, 002D Red wire (C)?

YES: Install K1 fuel relay. Go to next step.

NO: Check F1 fusible link. Test battery. Check 002E, 002C, and 002D Red wires and connections.

KN52281,1004404 -19-21JAN13-4/31

Step 3



LVAL11583 —UN—02NOV10

D—K3 Manifold Heater Relay, 002B Red Wire

Remove K3 manifold heater relay. Is battery voltage present at K3 manifold heater relay terminal 30, 002B Red wire (D)?

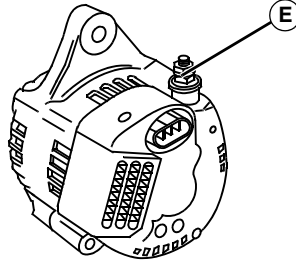
YES: Install K3 manifold heater relay. Go to next step.

NO: Check F2 fusible link. Test battery. Check 002E and 002B Red wires and connections.

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KN52281,1004404 -19-21JAN13-5/31

Step 4



LVAL11584 —UN—02NOV10

E—G2 Alternator Terminal B, 002A Red Wire

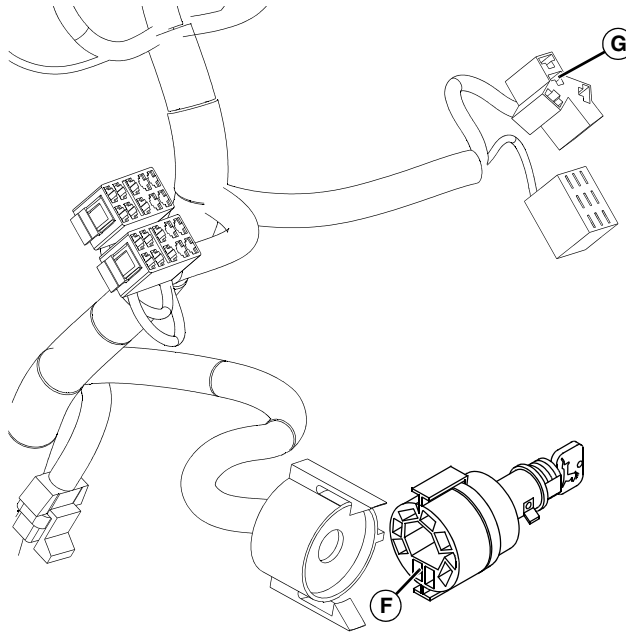
Is battery voltage present at G2 alternator terminal B, 002A Red wire (E)?

YES: Go to next step.

NO: Test battery. Check 002A Red wire and connections.

KN52281,1004404 -19-21JAN13-6/31

Step 5



LVAL38957 —UN—27NOV12

F—S1 Key Switch Terminal 1, 012A Red Wire

G—S2 Light Switch Terminal B, 122B Red Wire

Is battery voltage present at S1 key switch terminal 1, 012A Red wire (F)?

YES: Go to next step.

NO: Check F3 fuse. Check 012A Red wire and connections.

KN52281,1004404 -19-21JAN13-7/31

Step 6

Is battery voltage present at S2 light switch terminal B, 122B Red wire (G)?

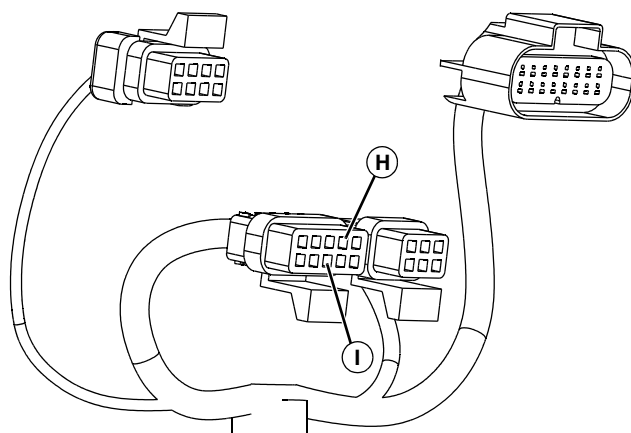
YES: Go to next step.

NO: Check F5 fuse. Check 122C and 122B Red wires and connections.

Continued on next page

KN52281,1004404 -19-21JAN13-8/31

Step 7



LVAL38960 —UN—27NOV12

H—X10 Connector Terminal D, 122E Red Wire

I— X10 Connector Terminal H, 122D Red Wire

Disconnect the X10 connector. Is battery voltage present at A1 display panel X10 connector terminal D (H) and H (I), 122E and 122D Red wires?

YES: Connect the X10 connector. Unswitched power circuit is OK, test switched power circuits.

NO: Check F5 fuse. Check 122C, 122E and 122D Red wires and connections.

KN52281,1004404 -19-21JAN13-9/31

Test Procedure B

Test Conditions

- Key switch in the RUN position, engine off.
- Transmission in neutral (PRT).
- PTO(s) off.

- Park brake locked.
- MFWD disengaged.
- Operator off seat.
- Light switch OFF.
- Turn signal switch OFF.

KN52281,1004404 -19-21JAN13-10/31

Switched Power Circuits

KN52281,1004404 -19-21JAN13-11/31

Step 1

Does display panel complete self test?

Do gauges on display panel sweep to full right pin then back to left to required position? Example; fuel gauge at half full mark.

Do all the indicator lights illuminate for 1 to 2 seconds?

Do the battery discharge and park brake lights remain illuminated? Is the engine oil pressure indicator light flashing?

Do all the segments of the LCD display illuminate for 1 to 2 seconds and then display the hours of operation?

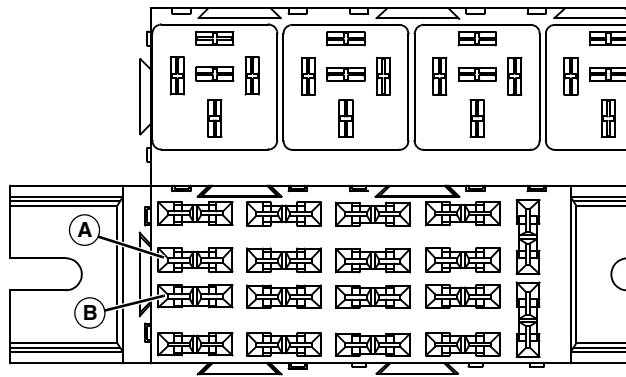
YES: Display panel is operational. Switched power circuit is functional. Go to next step.

NO: Check test conditions. Repeat test. Check unswitched power circuits. If OK, check individual circuits.

Continued on next page

KN52281,1004404 -19-21JAN13-12/31

Step 2



LVAL11587 —UN—02NOV10

A—Fuse F7, 072C Red Wire

B—Fuse F11, 212A Red Wire

Remove F7 and F11 fuses. Are fuses OK? Is battery voltage present at F7 and F11 fuses, 072C (A) and 212 (A) Red wires?

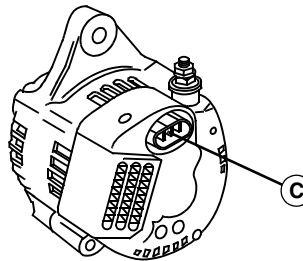
YES: Install F7 and F11 fuses. Go to next step.

NO: Replace fuse(s).

NO: Test key switch. Check 072B, 072C and 212A Red wires and connections.

KN52281,1004404 -19-21JAN13-13/31

Step 3



LVAL11588 —UN—02NOV10

C—G2 Alternator Terminal, 072A Red Wire

Is battery voltage present at G2 alternator, 072A Red wire (C)?

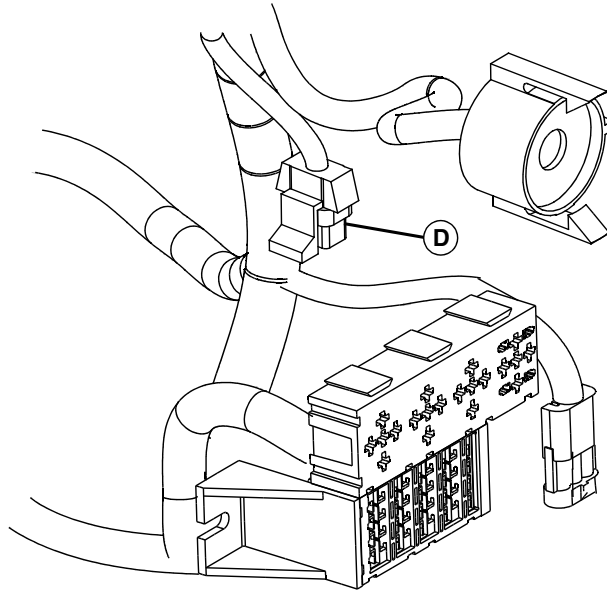
YES: Go to next step.

NO: Check 072B and 072A Red wires and connections.

Continued on next page

KN52281,1004404 -19-21JAN13-14/31

Step 4



I\VAL11589,—UN—02NOV10

D—X4 Connector Terminal A, 552B Red Wire

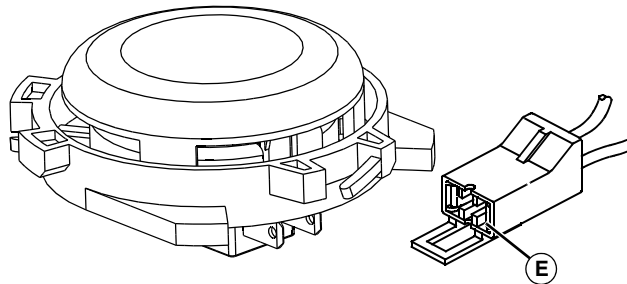
Disconnect X4 connector (D). Is battery voltage present at terminal A 552B Red wire?

YES: Connect the X4 connector. Go to next step.

NO: Check the F11 fuse. Check the 552 series Red wires.

KN52281,1004404 -19-21JAN13-15/31

Step 5



I\VAL11590,—UN—02NOV10

E—S6 Seat Switch, 562E Red Wire

Is battery voltage present at the S6 seat switch, 562E Red wire (E)?

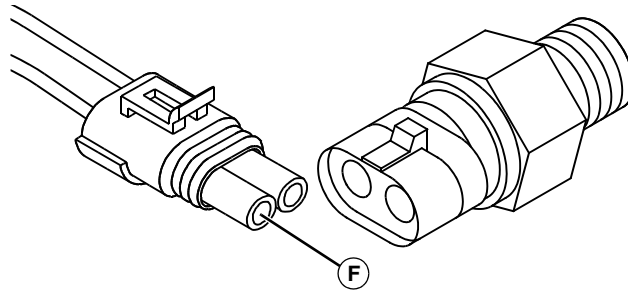
YES: Go to next step.

NO: Check the F7 fuse. Check the 562L, 562N and 562D Red wires. Test unswitched power circuit.

Continued on next page

KN52281,1004404 -19-21JAN13-16/31

Step 6



LVAL11591—UN—02NOV10

F—S7 MFWD Connector, 562K Red Wire

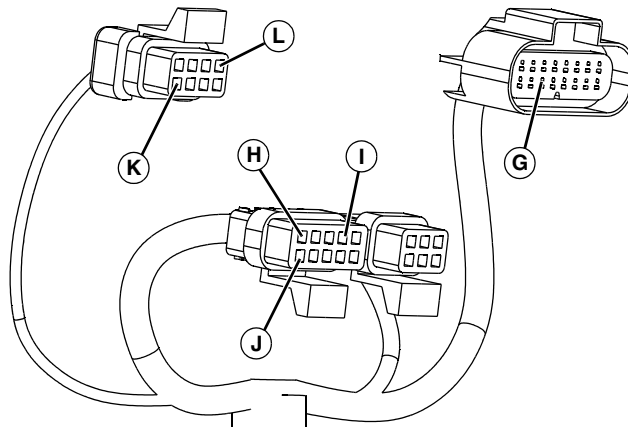
Is battery voltage present at the S7 MFWD engagement sensing switch, 562K Red wire (F)?

YES: Go to next step.

NO: Check the F7 fuse.
Check the 562D, 562N
and 562K Red wires. Test
unswitched power circuit.

KN52281,1004404 -19-21JAN13-17/31

Step 7



LVAL39840—UN—27NOV12

G—X7 Display Panel Connector, Terminal P 050E Blk Wire

H—X10 Connector Terminal A, 562H Red Wire

I— X10 Connector Terminal B, 519 Wht Wire

J—X10 Connector Terminal K, 586A Blu Wire

K—X11 Connector Terminal D, 594A Yel Wire

L—X11 Connector Terminal H, 050D Blk Wire

Is continuity to ground present at X7 connector terminal P, 050E Blk wire (H)?

YES: Connect X7
connector. Go to next step.

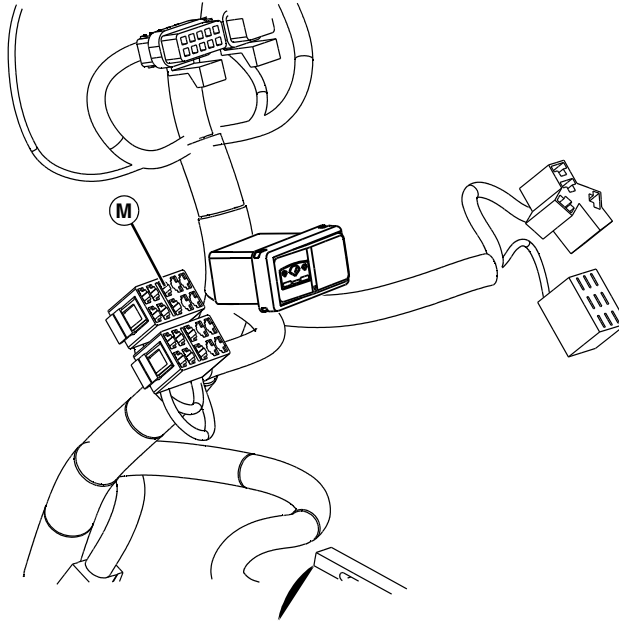
NO: Check 050E and 050A
Blk wires and connections.

Continued on next page

KN52281,1004404 -19-21JAN13-18/31

<p>Step 8</p>	<p>Disconnect X10 connector to the display panel. Is battery voltage present at terminals A, 562H Red (H), B, 519 Wht (I), and K, 586A Blu (J) wires?</p>	<p>YES: Connect X10 connector. Go to next step.</p> <p>NO: No voltage present at 562H Red wire. Test unswitched power circuit.</p> <p>NO: No voltage present at 519 Wht wire. Test transmission neutral switch (PRT). Check 519 Wht wire and connections. Test unswitched power circuit.</p> <p>NO: No voltage present at 586A Blu wire. Test park brake switch. Check 586A Blu wire and connections. Test unswitched power circuit.</p> <p>KN52281,1004404 -19-21JAN13-19/31</p>
<p>Step 9</p>	<p>Disconnect X11 connector to the display panel. Is battery voltage present at terminals D, 594A Yel (L) wire?</p>	<p>YES: Go to next step.</p> <p>NO: No voltage present at 594A Yel wire. Test mid PTO switch (if installed). Check 594A Yel wire and 562J Red wire and connections. Test unswitched power circuit.</p> <p>KN52281,1004404 -19-21JAN13-20/31</p>
<p>Step 10</p>	<p>Is continuity to ground present at terminal H, 050D Blk wire (L)?</p>	<p>YES: Connect X11 connector. Go to next step.</p> <p>NO: Check 050D and 050A Blk wires and connections.</p> <p>Continued on next page</p> <p>KN52281,1004404 -19-21JAN13-21/31</p>

Step 11



LVAL38947 —UN—27NOV12

M—S4 Display Module Switch, 562G Wire

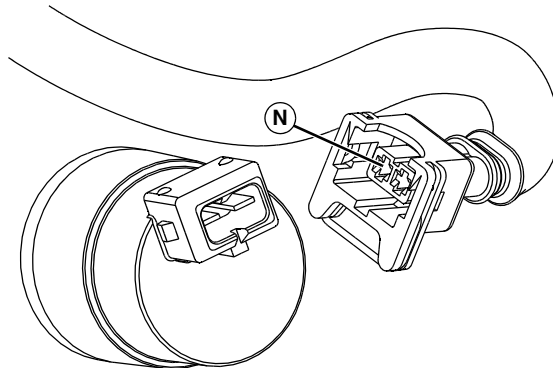
Disconnect the display mode switch. Is battery voltage present at S4 display mode switch connector 562G Red wire (M)?

YES: Connect display mode switch. Go to next step.

NO: Check the F7 fuse. Check the 562D and 562G Red wires. Test unswitched power circuit.

KN52281,1004404 -19-21JAN13-22/31

Step 12



LVAL38948 —UN—27NOV12

N—B1 Air Filter Restriction Switch, 562C Red Wire

Disconnect the air filter restriction switch. Is battery voltage present at B1 air filter restriction switch connector 562C Red wire (N)?

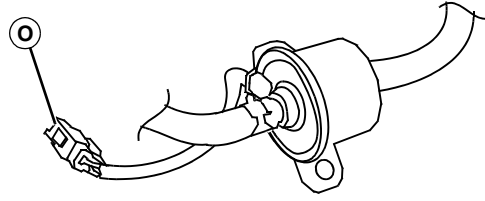
YES: Connect the air filter restriction switch. Go to next step.

NO: Check the F7 fuse. Check the 562 series Red wires. Test unswitched power circuit.

Continued on next page

KN52281,1004404 -19-21JAN13-23/31

Step 13



LVAL38949 —UN—27NOV12

O—M2 Fuel Pump, 562F Red Wire

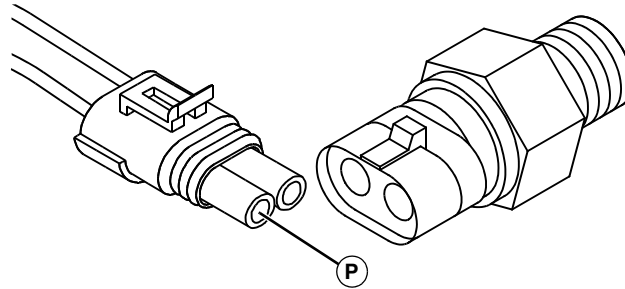
Is battery voltage present at 562F Red wire (O) of M2 fuel pump?

YES: Test complete.

NO: Check 562 series Red wires and connections.

KN52281,1004404 -19-21JAN13-24/31

Step 14



LVAL38950 —UN—27NOV12

P—S10 MFWD Engagement Sensing Switch, 562K Red Wire

Is battery voltage present at the S10 MFWD engagement sensing switch, 562K Red wire (P)?

YES: Go to next step.

NO: Check the F7 fuse. Check the 562K, 562N and 562D Red wires. Test unswitched power circuit.

KN52281,1004404 -19-21JAN13-25/31

Test Procedure C

Test Conditions

- Key switch in the RUN position, engine off.
- Transmission in neutral (PRT).
- PTO(s) off.

- Park brake locked.
- MFWD disengaged.
- Operator off seat.
- Light switch OFF.
- Turn signal switch OFF.

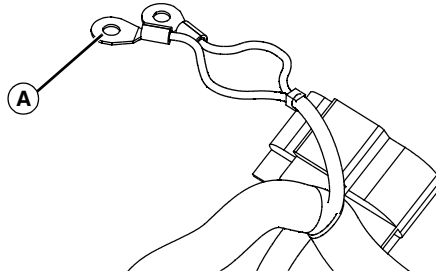
KN52281,1004404 -19-21JAN13-26/31

Secondary Switched Power Circuits

Continued on next page

KN52281,1004404 -19-21JAN13-27/31

Step 1



LVAL11597—UN—02NOV10

A—B4 Fuel Gauge Sensor, 353A Org Wire

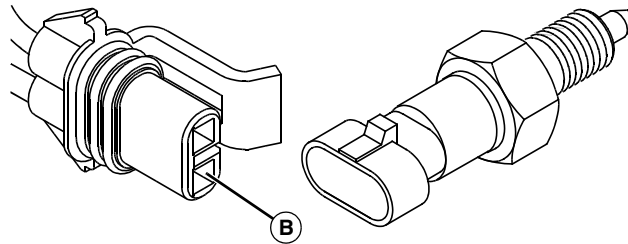
Is battery voltage present at B4 fuel gauge sensor, 353A Org wire (A)?

YES: Go to next step.

NO: Check 353A Org wire and connections. If OK, and test conditions are correct, replace display panel.

KN52281,1004404 -19-21JAN13-28/31

Step 2



LVAL11598—UN—02NOV10

B—B3 Engine Coolant Temperature Sensor, 359A Wht Wire

Is battery voltage present at B3 engine coolant temperature sensor, 359A Wht wire (B)?

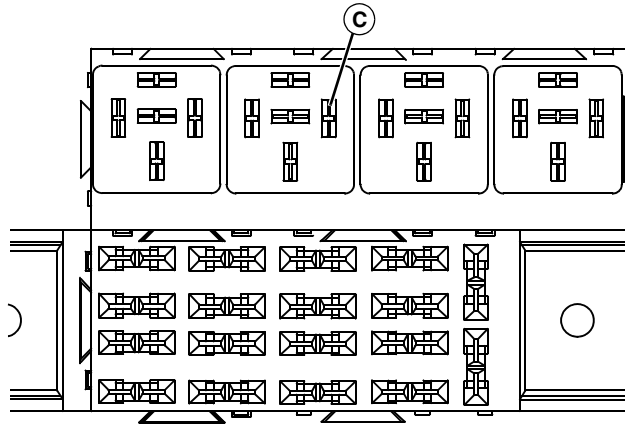
YES: Go to next step.

NO: Check 359A Wht wire and connections. If OK, and test conditions are correct, replace display panel.

Continued on next page

KN52281,1004404 -19-21JAN13-29/31

Step 3



LVAL11599—UN—02NOV10

C—K1 Fuel Relay Terminal 86, 304A Red Wire

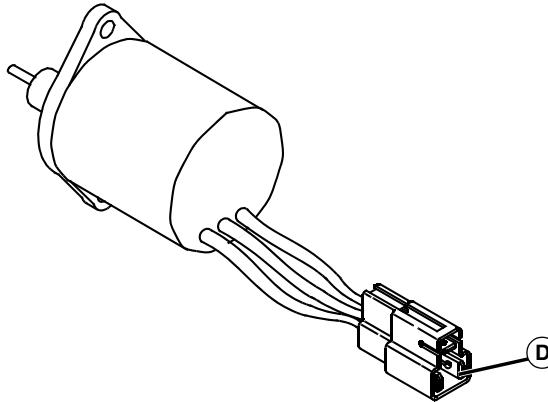
Remove K1 fuel relay. Is battery voltage present at K1 fuel relay terminal 86, 304A Red wire (C)?

YES: Install fuel relay.

NO: Check that test conditions are met. Check 304A Red wire and connections. If OK, replace display panel.

KN52281,1004404 -19-21JAN13-30/31

Step 4



LVAL11600—UN—02NOV10

D—Y2 Fuel Shutoff Solenoid, 302 Red Wire

Is battery voltage present at Y2 fuel shutoff solenoid, 302 Red wire (D)?

YES: Test complete.

NO: Check that test conditions are met. Check 302 Red wire and connections. If OK, replace display panel.

KN52281,1004404 -19-21JAN13-31/31

Cranking Circuit Operation—NA

Function:

To energize the starting motor solenoid and engage the starting motor to crank the engine.

Operating Conditions:

- Key switch in START position
- Transmission in neutral
- Rear PTO off

Theory of Operation:

⚠ CAUTION: Avoid Injury! ALWAYS engage park brake when starting the engine.

The starting circuit is controlled through the A1 display panel based upon “IF” “THEN” logic. If the operating conditions are met, then the display panel will supply an output signal to the K2 start relay.

The power circuit provides unswitched (122E and 122D Red wires), and switched (562H Red wire) to the display panel. This turns the display panel on.

The display panel will supply an output to 518 Gry wire to energize the K2 start relay when it receives input from the S1 key switch (start position) at wire 572A Red, the S3 PTO switch (off position) at wire 573 Org, the S10 transmission neutral switch (neutral position) (PRT only) at wire 519 Wht, and the G2 alternator (engine rpm less than 400) at wire 325B Grn.

When placed in the start position, the key switch provides power to the 572B Red wire which splices to the 572A and 572C Red wires. The 572A Red wires supplies the input signal to the display while the 572C Red wire supplies power to the 30 terminal of the K2 start relay.

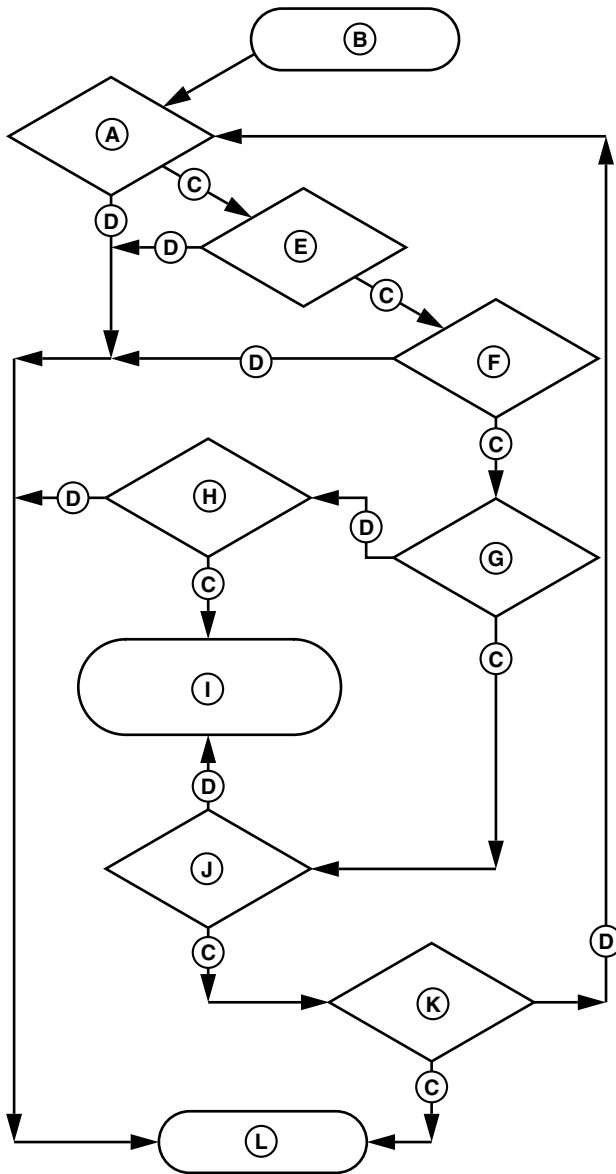
When the operating conditions have been met, the display panel will provide output power on 518 Gry wire to the start relay at terminal 86 for up to 60 seconds per starting attempt. This will energize the start relay to close its contacts to provide power from the 572C Red wire to the 309 Wht wire. The 309 Wht wire connects to the Y1 starting motor solenoid to energize the starting motor solenoid. With the starting motor solenoid energized, the starting motor solenoid contacts close and high current from the battery passes through the battery cable and solenoid contacts to the starting motor. The starting motor cranks the engine.

During the cranking process, the display panel monitors the engine speed from an input from the alternator on the 325B Grn wire. An input on the 325B Grn wire indicates that the engine is turning. If the engine rpm is greater than 400 rpm when the key is placed in the start position to crank the engine, the display will read this as the engine already running and not provide an output signal to the start relay. If, during the cranking function, the engine rpm increases to 800 rpm or greater for 3 consecutive

seconds, the display panel will read this as the engine is running and will remove the output signal to the start relay.

The following flow chart is a diagram of the display panel cranking circuit logic.

To allow the engine to start the fuel shutoff solenoid must also be energized to pull in and hold in the fuel shutoff solenoid. (See [Fuel Supply/Engine Shutoff Circuit Operation \(NA\).](#)) for a detailed description of the fuel circuit.



LVAL17474 —UN—29APR11

A—Transmission in Neutral?
 B—Attempt to Start Engine
 C—Yes
 D—No
 E—PTO off?
 F—Key switch in Start Position?

G—Start Relay Already Engaged?
 H—Engine Speed < 400 rpm?
 I— Output Signal to Start Relay (maximum 60 seconds)
 J— Engine Speed > 800 rpm?
 K—3 Consecutive Seconds?
 L—No Output Signal to Start Relay

KN52281,1004405 -19-07JAN13-2/2

Cranking Circuit Operation—MY13

Function

To energize the starting motor solenoid and engage the starting motor to crank the engine.

Operating Conditions

- Key switch in START position
- Transmission in neutral
- Rear PTO switch in OFF position

Theory of Operation

⚠ CAUTION: Avoid Injury! ALWAYS engage park brake when starting the engine.

The starting circuit is controlled through the A1 display panel based upon “IF” “THEN” logic. If the operating conditions are met, then the display panel will supply an output signal to the K2 start relay.

Unswitched power is supplied to the A1 display panel at terminals D and H (122E and 122D Red wires) on the X10 connector. When the key switch is in the RUN or START position, switched power is supplied to the A1 display panel at terminal A (562H Red wire) on the X10 connector, powering up the display panel. For more information, see [Power Circuit Operation—NA](#) in Section 40, Group 40.

The display panel will supply an output to 518A Gry wire to energize the K2 start relay when it detects the following inputs:

- Battery voltage at terminal D (572A Red wire) on the X7 connector from S1 key switch (START position).
- Battery voltage at terminal B (519 Wht wire) on the X10 connector from S10 transmission neutral switch (NEUTRAL position) (PRT only).
- No voltage at terminal K (574A Yel wire) on the X7 connector from S3 rear PTO switch (OFF position).
- Input data at terminal R (924A Yel wire) on the X7 connector from A2 electronic drive controller indicating engine speed is less than 400 rpm.

When placed in the START position, the key switch provides power to the 572B Red wire, which splices to the

572A and 572C Red wires. The 572A Red wires supplies the start input signal to the display panel, while the 572C Red wire supplies power to terminal 30 on the K2 start relay.

When all cranking conditions have been met, the display panel will provide output power on 518A Gry wire to terminal 86 on the start relay, energizing the relay for up to 60 seconds per start attempt.

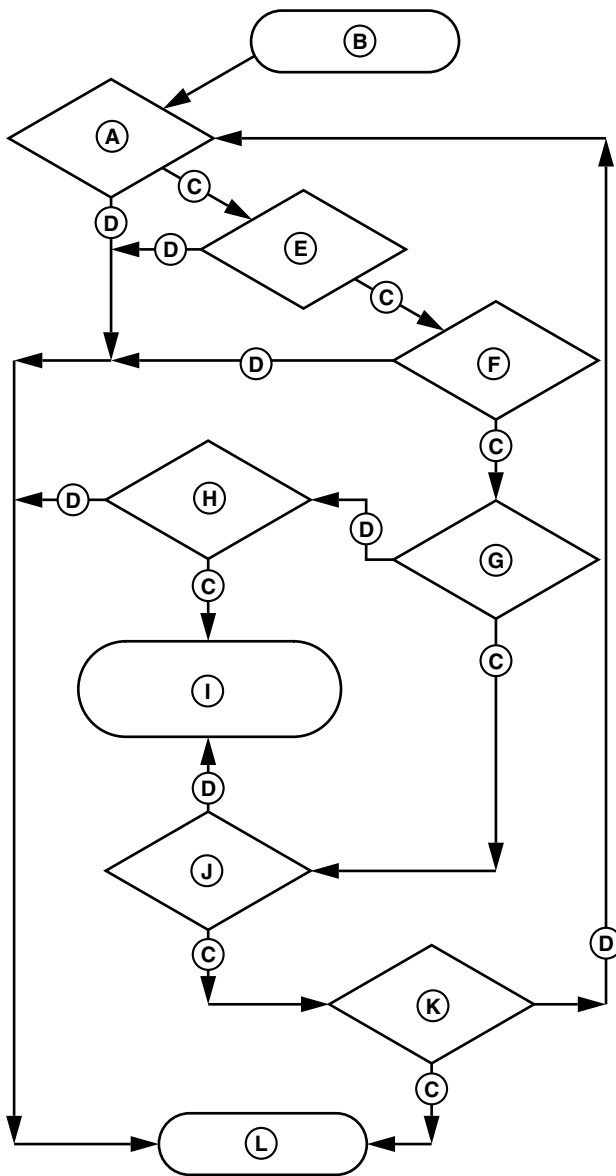
When energized, the start relay contacts are closed, allowing current to flow from the 572C Red wire through the 309 Wht wire to the Y1 starting motor solenoid, energizing the starting motor solenoid. With the starting motor solenoid energized, the solenoid contacts close and high current from the battery flows through the battery cable and starter motor solenoid contacts to the starting motor. The starting motor activates and cranks the engine.

During the cranking process, the display panel monitors engine speed data provided by the A2 electronic drive controller. The A2 electronic drive controller receives a pulsed current from the alternator IG terminal via the 325C and 325D Grn wires. From the pulsed current, the A2 drive controller determines the speed the engine is turning, then transmits the engine speed information across the RS232 communication link (924A and 924B Yel wires) to the A1 display panel.

If the engine speed is greater than 400 rpm when the key switch is placed in the START position to crank the engine, the logic in the display panel will determine the engine is already running and will not provide an output signal to the start relay. If, during the cranking function, the engine speed increases to 800 rpm or greater for 3 consecutive seconds, the logic in the display panel will determine the engine is running and will remove the output signal to the start relay, even if the key switch is still in the START position.

For the engine to start, the pull-in and hold-in coils of the Y2 fuel shutoff solenoid must be energized. For operation of the fuel circuit, see [Fuel Supply/Engine Shutoff Circuit Operation—MY13](#).

The following flow chart is a diagram of the display panel cranking circuit logic.



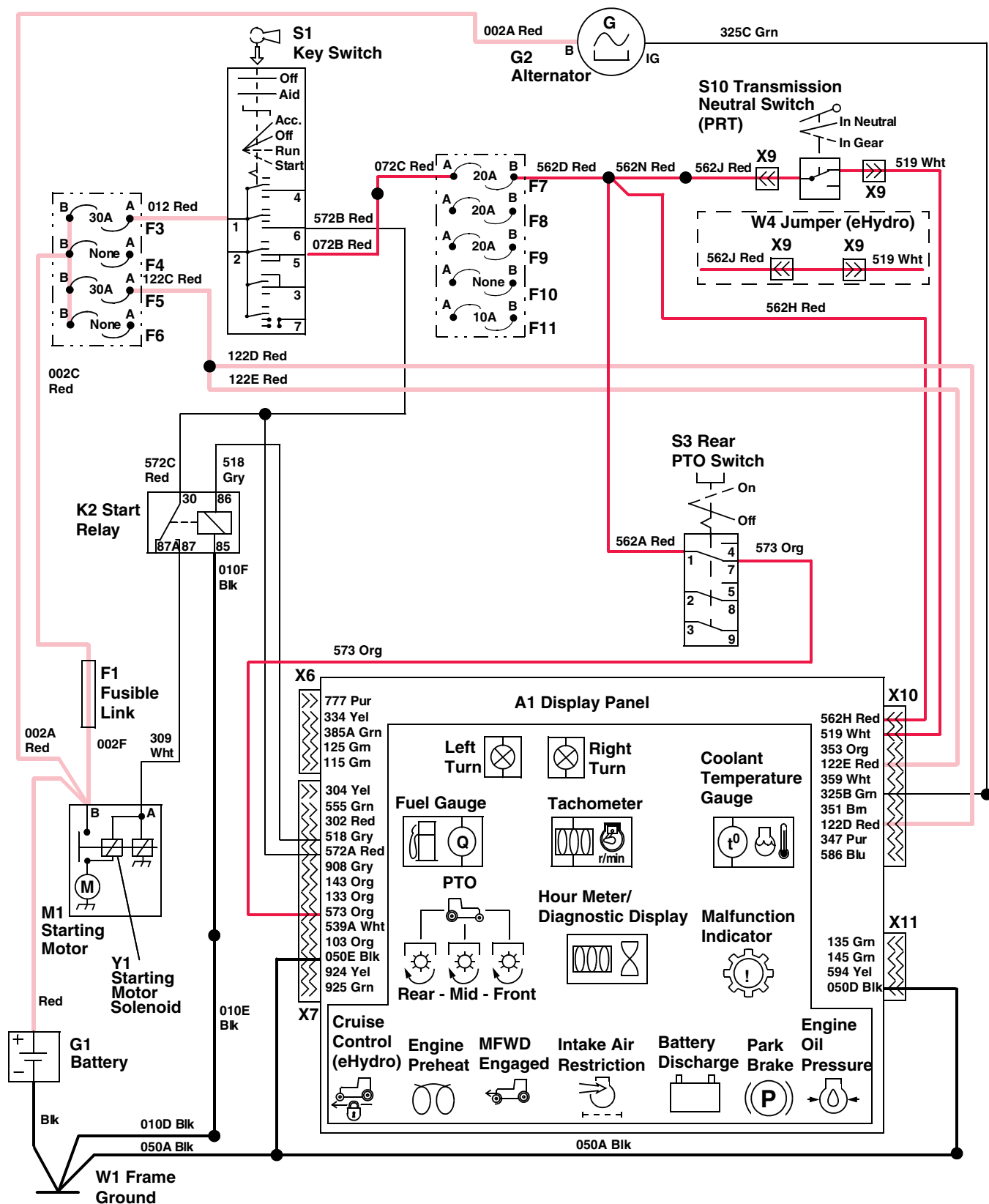
LVAL17474 —UN—29APR11

A—Transmission in Neutral?
 B—Attempt to Start Engine
 C—Yes
 D—No
 E—PTO Off?
 F—Key switch in START Position?

G—Start Relay Already Engaged?
 H—Engine Speed < 400 rpm?
 I— Output Signal to Start Relay (maximum 60 seconds)
 J— Engine Speed > 800 rpm?
 K—3 Consecutive Seconds?
 L—No Output Signal to Start Relay

KN52281,1004406 -19-21JAN13-2/2

Cranking Circuit Electrical Schematic—Pre MY08



LVAL11602 —UN—02NOV10

Continued on next page

KN52281,1004407 -19-02NOV12-1/2

A1—Display Panel
 F1— Fusible Link
 F3— Fuse 30A
 F4— Not Used
 F5— Fuse 30A
 F6— Not Used
 F7— Fuse 20A
 F8— Fuse 20A
 F9— Fuse 20A
 F10— Not Used
 F11— Fuse 10A
 G1—Battery

G2—Alternator
 K2—Fuel Relay
 M1—Starting Motor
 S1— Key Switch
 S3— Rear PTO Switch
 S10— Transmission Neutral
 Switch (PRT)
 W1—Frame Ground
 W4—Jumper (eHydro™)

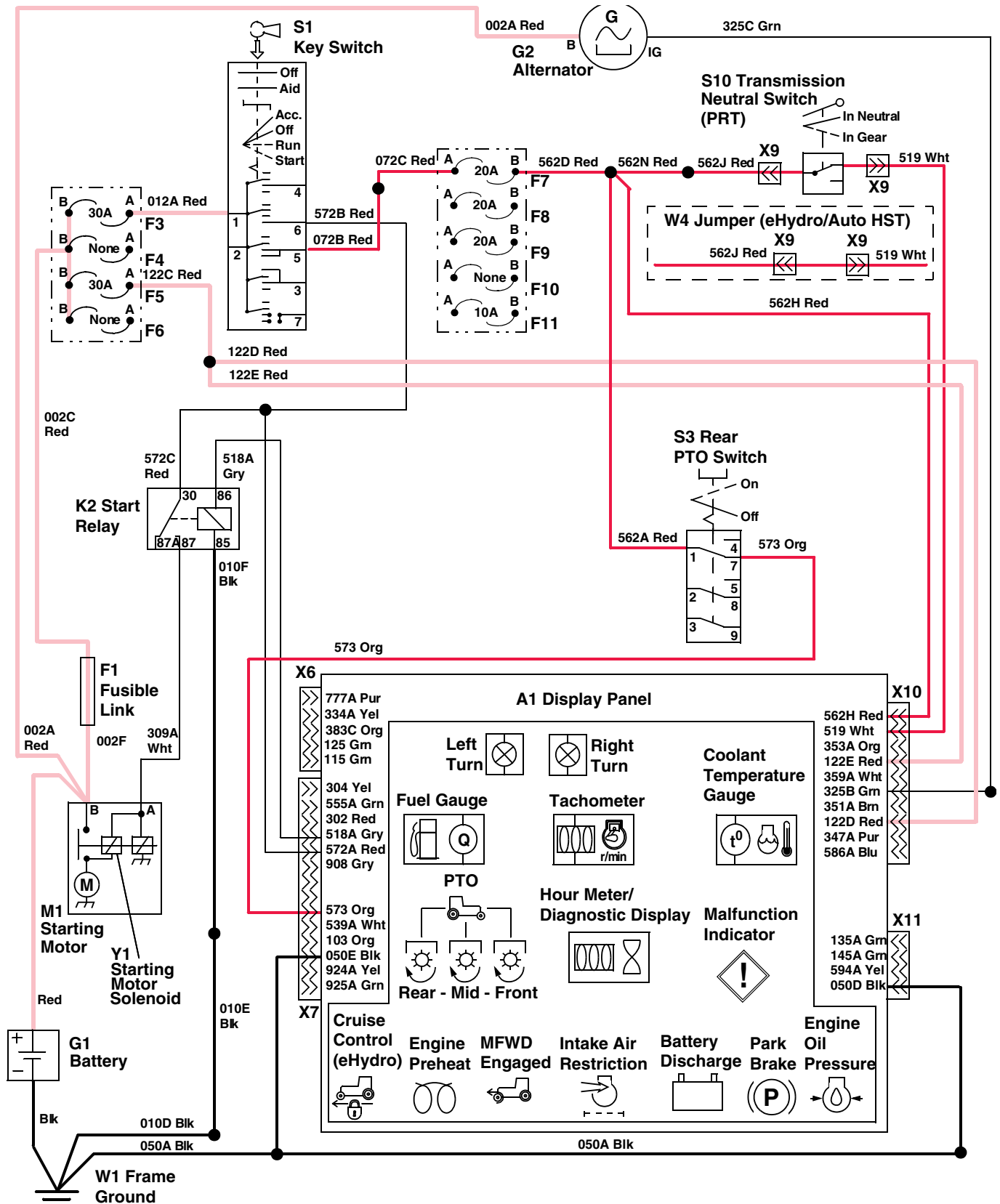
X6— W1 Main Wiring
 Harness-to-A1 Display Panel
 X7— W1 Main Wiring
 Harness-to-A1 Display Panel
 X9— W1 Main Wiring Harness to
 S10 Transmission Neutral
 Switch (PRT), W4 Jumper
 Plug (eHydro™)

X10— W1 Main Wiring
 Harness-to-A1Display
 Panel
 X11— W1 Main Wiring
 Harness-to-A1 Display
 Panel
 Y1— Starting Motor Solenoid

eHydro is a trademark of Deere & Company

KN52281,1004407 -19-02NOV12-2/2

Cranking Circuit Electrical Schematic—MY08



LVAL11603 —UN—02NOV10

Continued on next page

KN52281,1004408 -19-02NOV12-1/2

A1—Display Panel
 F1—Fusible Link
 F3—Fuse 30A
 F4—Not Used
 F5—Fuse 30A
 F6—Not Used
 F7—Fuse 20A
 F8—Fuse 20A
 F9—Fuse 20A
 F10—Not Used
 F11—Fuse 10A
 G1—Battery
 G2—Alternator

K2—Fuel Relay
 M1—Starting Motor
 S1—Key Switch
 S3—Rear PTO Switch
 S10—Transmission Neutral
 Switch (PRT)
 W1—Frame Ground
 W4—Jumper (eHydro™/Auto
 HST)

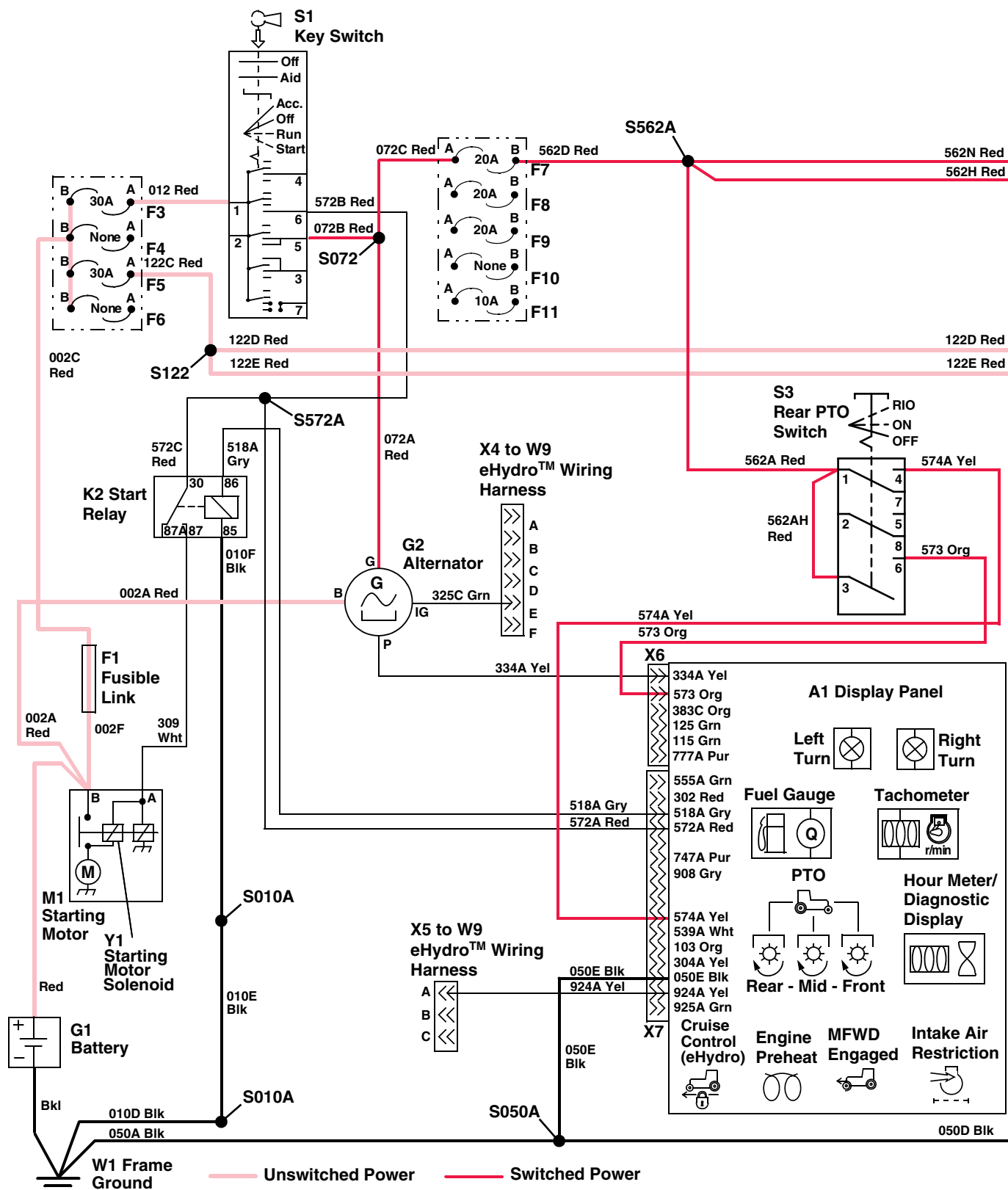
X6—W1 Main Wiring
 Harness-to-Display Panel
 X7—W1 Main Wiring
 Harness-to-Display Panel
 X9—W1 Main Wiring Harness to
 S10 Transmission Neutral
 Switch (PRT), W4 Jumper
 Plug (eHydro™/Auto HST)

X10—W1 Main Wiring
 Harness-to-A1 Display
 Panel
 X11—W1 Main Wiring
 Harness-to-A1 Display
 Panel
 Y1—Starting Motor Solenoid

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KN52281,1004408 -19-02NOV12-2/2

Cranking Circuit Electrical Schematic—MY13



Cranking Circuit Electrical Schematic—MY13 (1 of 2)

Continued on next page

KN52281,1004409 -19-09JAN13-1/4

A1—Display Panel
 F1— Fusible Link
 F3— Fuse 30A
 F4— Not Used
 F5— Fuse 30A
 F6— Not Used
 F7— Fuse 20A
 F8— Fuse 20A
 F9— Fuse 20A
 F10— Not Used

F11— Fuse 10A
 G1—Battery
 G2—Alternator
 K1—Fuel Relay
 M1—Starting Motor
 S1— Key Switch
 S3— Rear PTO Switch
 W1—Frame Ground
 X4— W1 Main Wiring Harness-
 to-W9 eHydroeHydro™/Auto
 HST Wiring Harness

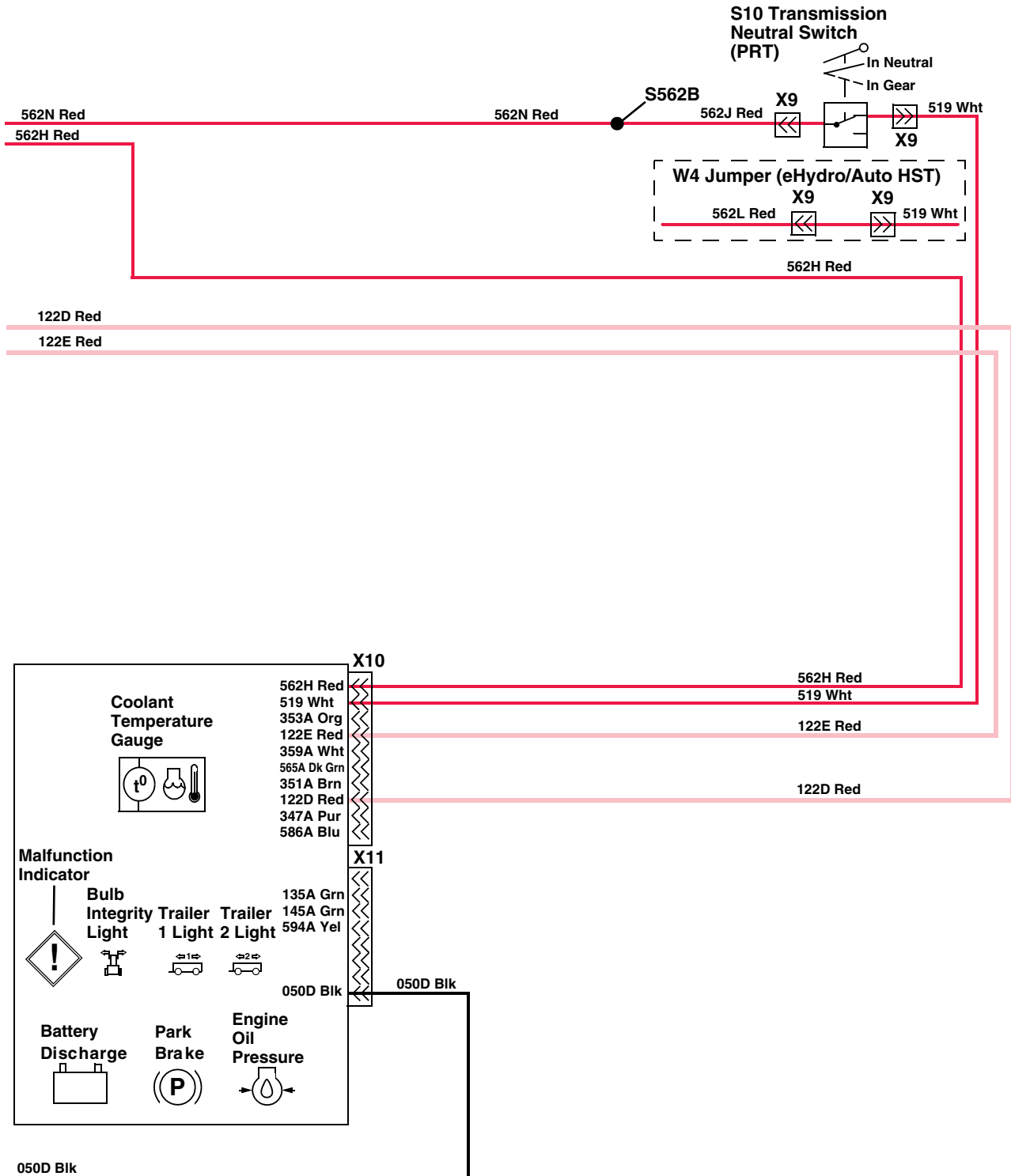
X5— W1 Main Wiring Harness-
 to-W9 eHydro™/Auto HST
 Wiring Harness
 X6— W1 Main Wiring
 Harness-to-Display Panel
 X7— W1 Main Wiring
 Harness-to-Display Panel

Y1— Starting Motor Solenoid

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Continued on next page

KN52281,1004409 -19-09JAN13-2/4



Cranking Circuit Electrical Schematic—MY13 (2 of 2)

Continued on next page

KN52281,1004409 -19-09JAN13-3/4

LVAL38723 —UN—17 JAN13

S10— Transmission Neutral Switch (PRT)
W4—Jumper (eHydro™/Auto HST)

X9— W1 Main Wiring Harness to S10 Transmission Neutral Switch (PRT), W4 Jumper Plug (eHydro™/Auto HST)

X10— W1 Main Wiring Harness-to-A1 Display Panel
X11— W1 Main Wiring Harness-to-A1 Display Panel

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KN52281,1004409 -19-09JAN13-4/4

Cranking Circuit Diagnosis

Test Procedure A

Fault codes Err72 and Err73 indicate a problem with the output signal on wire 518 Gry or the K2 start relay.

Test Conditions:

- Rear PTO off.
- Transmission in neutral (PRT).
- Key switch in the start position.
- Display panel is powered on. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

KN52281,100440A -19-02NOV12-1/8

Cranking Circuit

KN52281,100440A -19-02NOV12-2/8

Step 1

Is Err72 or Err73 showing on the display panel?

YES: Err72—Short to ground. Test the start relay. Check the 518 Gry wire and connections for a short to ground.

YES: Err73—Short to battery voltage or open circuit. Test the start relay. Check the 518 Gry wire and connections for a short battery voltage or broken wire or connection.

NO: Go to next step.

KN52281,100440A -19-02NOV12-3/8

Step 2

Is battery voltage present at the starting motor solenoid A terminal?

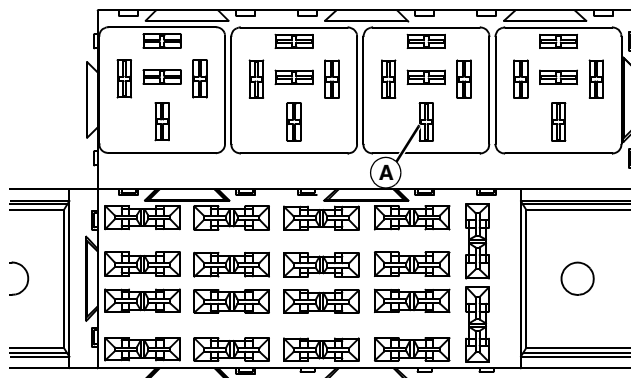
YES: Test starting motor solenoid and starting motor. Repair or replace as needed.

NO: Test start relay. Check 309 Wht wire and connections. Check 010F, 010E and 010D Blk to ground. Go to next step.

Continued on next page

KN52281,100440A -19-02NOV12-4/8

Step 3



LVAL11604—UN—02NOV10

A—K2 Start Relay Terminal 30, 572C Red Wire

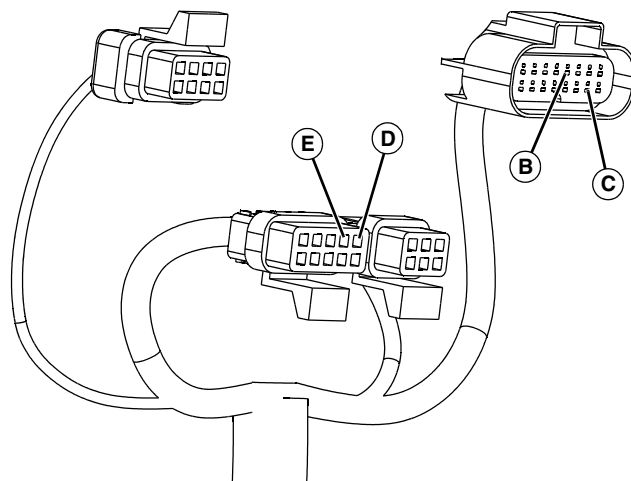
Remove K2 start relay. Is battery voltage present at K2 start relay terminal 30, 572C Red wire (A) with key switch in the start position?

YES: Install start relay. Go to next step.

NO: Test key switch. Check 572A, 572B, and 572C Red wires and connections.

KN52281,100440A -19-02NOV12-5/8

Step 4



LVAL11605—UN—02NOV10

B—X7 Connector Terminal D, 572A Red Wire

C—X7 Connector Terminal K, 573 Org Wire

D—X10 Connector Terminal A, 562H Red Wire

E—X10 Connector Terminal B, 519 Wht Wire

Disconnect X7 connector from display panel. Is battery voltage present at terminals D, 572A Red (B) wire and K, 573 Org (C) wire with key switch in the start position?

YES: Install X7 connector. Go to next step.

NO: 573 Org wire—Test rear PTO switch. Check 573 Org wire and connections. Test switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

NO: 572A Red wire—Test key switch. Check 572A, 572B, and 572C Red wires and connections.

Continued on next page

KN52281,100440A -19-02NOV12-6/8

Step 5

Disconnect X10 connector from display panel. Is battery voltage present at terminals A, 562H Red (D) wire and B, 519 Wht (E) wire with key switch in the start position?

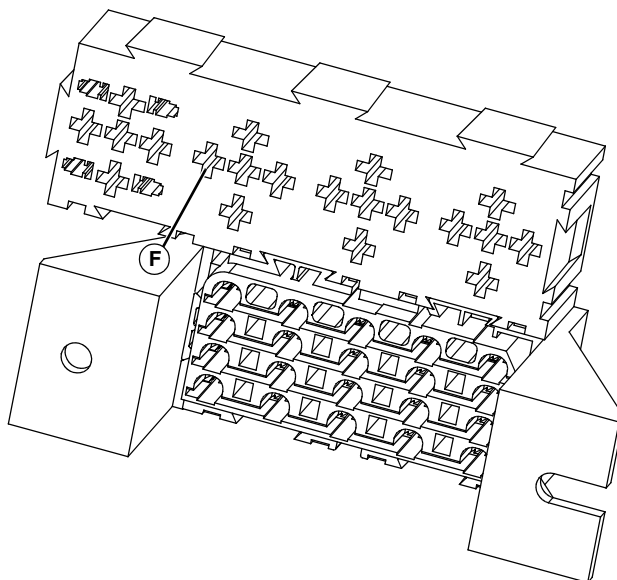
YES: Install X10 connector. Go to next step.

NO: 562H Red wire—Test switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

NO: 519 Wht wire—Test transmission neutral switch. Check 519 Wht wire and connections. Test switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

KN52281,100440A -19-02NOV12-7/8

Step 6



LVAL11606 —UN—02NOV10

F—Fuse Block, 518 Gry Wire

Remove fuse block to access 518 Gry wire. Is battery voltage present at 518 Gry wire (F) with key switch in the start position?

YES: Test complete.

NO: Check 518 Gry wire and connections. If OK, replace A1 display panel.

KN52281,100440A -19-02NOV12-8/8

Cranking Circuit Diagnosis—MY13

Test Procedure A

Fault codes Err72 and Err73 indicate a problem with the output signal on wire 518A Gry or the K2 start relay.

Test Conditions

- PTO off.
- Transmission in neutral (PRT).
- Key switch the START position.
- Display panel powered up. (See [Power Circuit Diagnosis—MY13—NA.](#))

KN52281,100440B -19-21JAN13-1/8

Cranking Circuit

Continued on next page

KN52281,100440B -19-21JAN13-2/8

Step 1

Is Err72 or Err73 showing on the display panel?

YES: Err72—Short to ground. Test the start relay. Check the 518A Gry wire and connections for a short to ground.

YES: Err73—Short to battery voltage or open circuit. Test the start relay. Check the 518A Gry wire and connections for a short battery voltage or broken wire or connection.

NO: Go to next step.

KN52281,100440B -19-21JAN13-3/8

Step 2

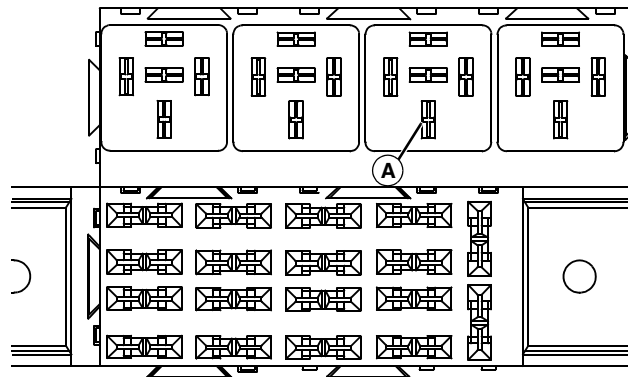
Is battery voltage present at the starting motor solenoid A terminal?

YES: Test starting motor solenoid and starting motor. Repair or replace as needed.

NO: Test start relay. Check 309A Wht wire and connections. Check 010F, 010E and 010D Blk to ground. Go to next step.

KN52281,100440B -19-21JAN13-4/8

Step 3



LVAL11604—UN—02NOV10

A—K2 Start Relay Terminal 30, 572C Red Wire

Remove K2 start relay. Is battery voltage present at K2 start relay terminal 30, 572C Red wire (A) with key switch in the start position?

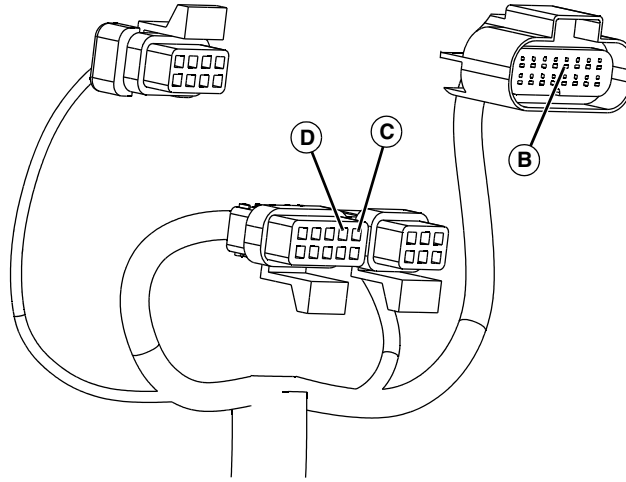
YES: Install start relay. Go to next step.

NO: Test key switch. Check 572A, 572B, and 572C Red wires and connections.

Continued on next page

KN52281,100440B -19-21JAN13-5/8

Step 4



LVAL38961—UN—27NOV12

B—X7 Connector Terminal D, 572A Red Wire
C—X10 Connector Terminal A, 562H Red Wire
D—X10 Connector Terminal B, 519 Wht Wire

Disconnect X7 connector from display panel. Is battery voltage present at terminals D, 572A Red (B) wire with key switch in the start position?

YES: Install X7 connectors. Go to next step.

NO: 572A Red wire—Test key switch. Check 572A, 572B, and 572C Red wires and connections.

KN52281,100440B -19-21JAN13-6/8

Step 5

Disconnect X10 connector from display panel. Is battery voltage present at terminals A, 562H Red (C) wire and B, 519 Wht (D) wire with key switch in the start position?

YES: Install X10 connector. Go to next step.

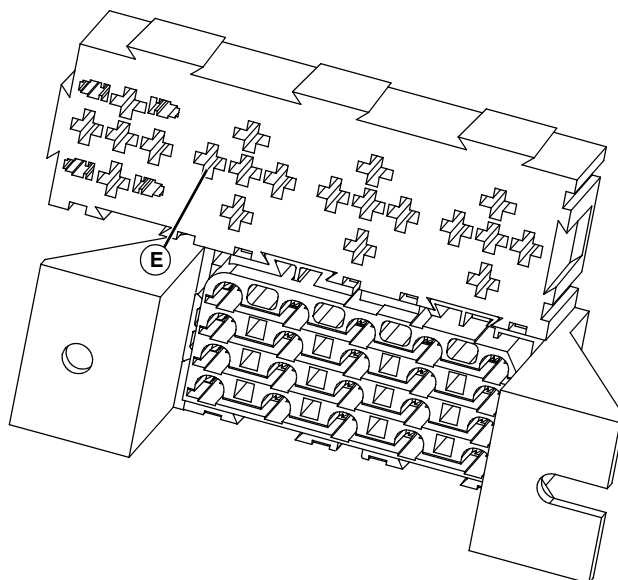
NO: 562H Red wire—Test switched power circuit. (See [Power Circuit Diagnosis—MY13—NA.](#))

NO: 519 Wht wire—Test transmission neutral switch. Check 519 Wht wire and connections. Test switched power circuit. (See [Power Circuit Diagnosis—MY13—NA.](#))

Continued on next page

KN52281,100440B -19-21JAN13-7/8

Step 6



LVAL38962 —UN—27NOV12

E—Fuse Block, 518A Gry Wire

Remove fuse block to access 518A Gry wire. Is battery voltage present at 518A Gry wire (E) with key switch in the start position?

YES: Test complete.

NO: Check 518A Gry wire and connections. If OK, replace A1 display panel.

KN52281,100440B -19-21JAN13-8/8

Manifold Heater and Indicator Light Circuit Operation

Function:

To provide an added source of heat for the combustion chamber during cold starts, especially below **5°C (40°F)** and to illuminate a light on the display panel and indicate to the operator that voltage is being provided to the manifold heater.

Operating Conditions:

- Key switch must be in the start or run position and pushed in to the aid position.

Theory of Operation:

The ignition system is designed to inject diesel fuel into the piston cylinder where heat from compression ignites the fuel and air mixture. When starting a cold engine, compression may not provide enough heat to ignite the fuel. A manifold heater is installed to provide added heat to the combustion chamber.

The manifold heater is energized (heated) when the key switch is placed in the AID position (key pushed into

switch). The key can be pushed into the AID position with the key in either the start or run position. The manifold heater may be preheated by pushing in the key, with the switch in the run position, for up to 3 seconds before turning the key to the start position.

When the key switch is in the aid position, current is provided to the K3 manifold heater relay coil (terminal 86) through the 385 series Grn wires. When the relay coil is energized, the relay contacts close and unswitched power (002B Red wire—terminal 30) flows through the contacts and 383 Org wire to the manifold heater.

The engine preheat indicator light in the display panel provides a visual indication that the key is in the AID position and the manifold heater relay is being energized. In this position, battery voltage is provided to the engine preheat light through the 385B and 385A Grn wires, X6 connector (terminal C), and display panel circuit board. A circuit board run provides voltage to the engine preheat light.

A ground circuit path for the display panel circuit board is provided through the X7 and X11 connectors (terminals P and H), and 050E, 050D, and 050A Blk wires.

KN52281,100440C -19-02NOV12-1/1

Manifold Heater and Indicator Light Circuit Operation—MY13

Function

To provide an added source of heat for the combustion chamber during cold starts, especially below **5°C (40°F)** and to illuminate a light on the display panel to indicate to the operator that voltage is being provided to the manifold heater.

Operating Conditions

- Key switch must be in the START or RUN position and pushed in to the AID position.

Theory of Operation

The ignition system is designed to inject diesel fuel into the piston cylinder where heat from compression ignites the fuel and air mixture. When starting a cold engine, compression may not provide enough heat to ignite the fuel. A manifold heater is installed to provide added heat to the combustion chamber.

The manifold heater is energized (heated) when the key switch is in either the START or RUN position and key

is pushed to the AID position (key pushed into switch). Before turning the key switch to the START position, the manifold heater may be preheated by pushing the key to the AID position for up to 3 seconds when the key switch is in the RUN position.

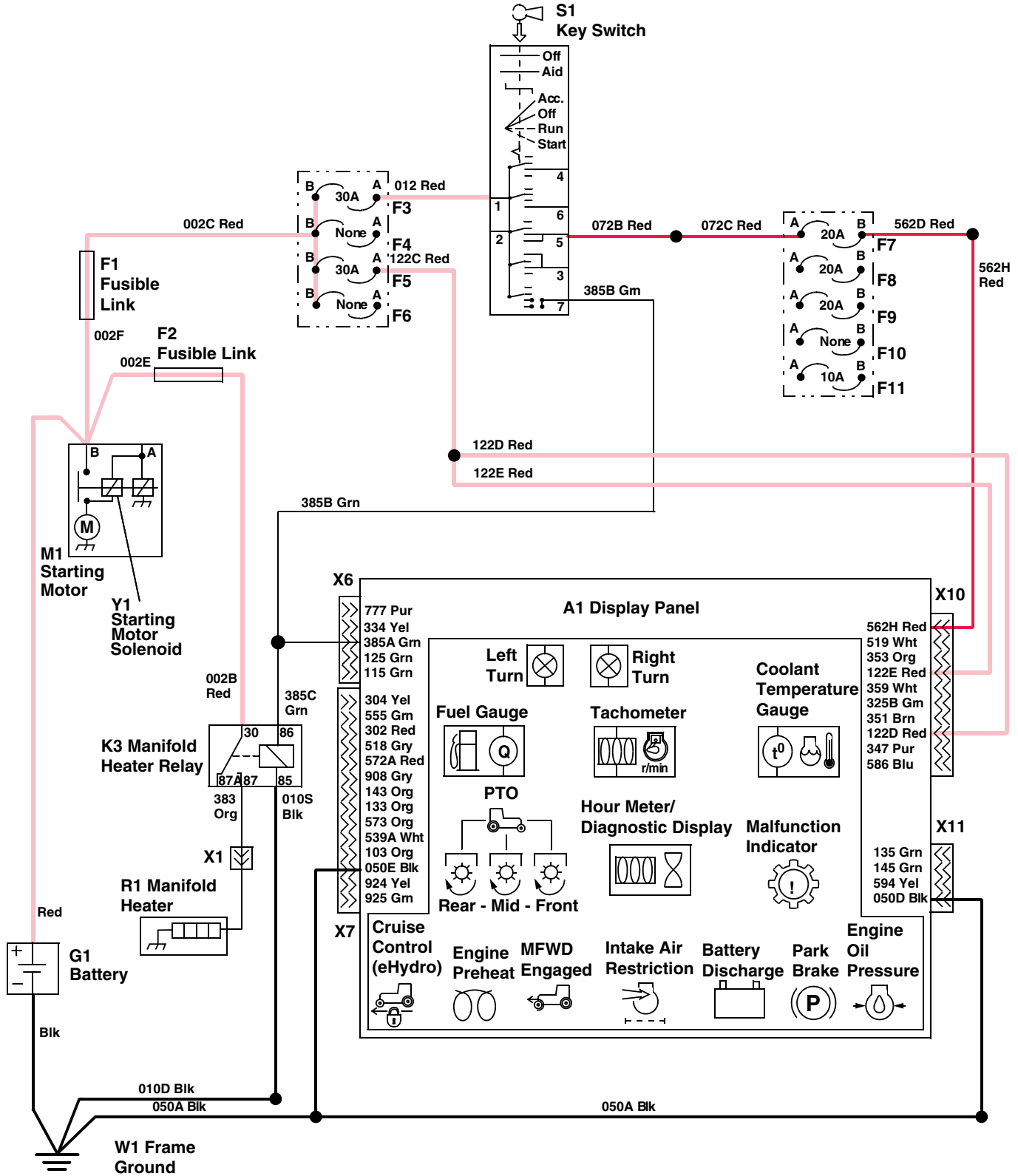
When the key switch is in the AID position, current is provided to the K3 manifold heater relay coil (terminal 86) through the 385A Grn wire. When the relay coil is energized, the relay contacts close and unswitched power from the 002B Red wire (terminal 30) flows through the contacts and 383A Org wire to the R1 manifold heater.

The engine preheat indicator light in the display panel provides a visual indication that the key switch is in the AID position and the manifold heater relay is being energized. In this position, battery voltage is provided to the engine preheat light to terminal C (383C Org wire) on the X6 connector, illuminating the engine preheat indicator light on the display panel.

A ground circuit path for the display panel is provided to terminal P (050E Blk wire) on the X7 connector and to terminal H (050D Blk wire) on the X11 connector. Both are spliced to the 050A Blk wire, which connects to W1 frame ground.

KN52281,100440D -19-21JAN13-1/1

Manifold Heater and Indicator Light Circuit Electrical Schematic—Pre MY08



LVAL11607 —UN—02NOV10

Continued on next page

KN52281,100440E -19-02NOV12-1/2

A1—Display Panel
 F1—Fusible Link
 F2—Fusible Link
 F3—Fuse 30A
 F4—Not Used
 F5—Fuse 30A
 F6—Not Used
 F7—Fuse 20A
 F8—Fuse 20A
 F9—Fuse 20A

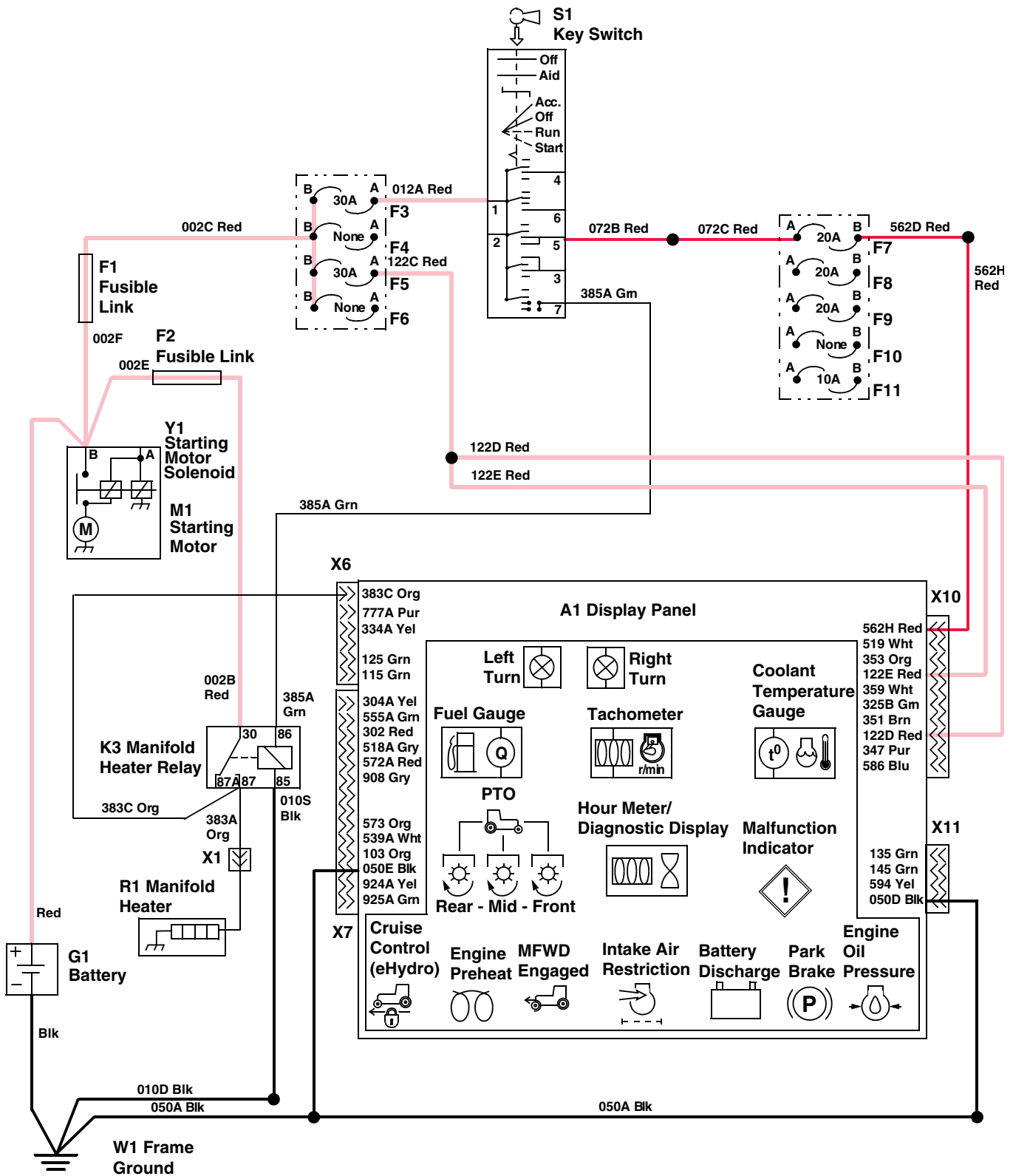
F10—Not Used
 F11—Fuse 10A
 G1—Battery
 K3—Manifold Heater Relay
 M1—Starting Motor
 R1—Manifold Heater
 S1—Key Switch
 W1—Frame Ground

X1—W1 Main Wiring
 Harness-to-R1 Manifold
 Heater
 X6—W1 Main Wiring
 Harness-to-A1 Display Panel
 X7—W1 Main Wiring
 Harness-to-A1 Display Panel

X10—W1 Main Wiring
 Harness-to-A1 Display
 Panel
 X11—W1 Main Wiring
 Harness-to-A1 Display
 Panel
 Y1—Starting Motor Solenoid

KN52281,100440E -19-02NOV12-2/2

Manifold Heater and Indicator Light Circuit Electrical Schematic—MY08



LVAL11608 —UN—02NOV10

Continued on next page

KN52281,100440F -19-02NOV12-1/2

A1—Display Panel
 F1— Fusible Link
 F2— Fusible Link
 F3— Fuse 30A
 F4— Not Used
 F5— Fuse 30A
 F6— Not Used
 F7— Fuse 20A
 F8— Fuse 20A
 F9— Fuse 20A

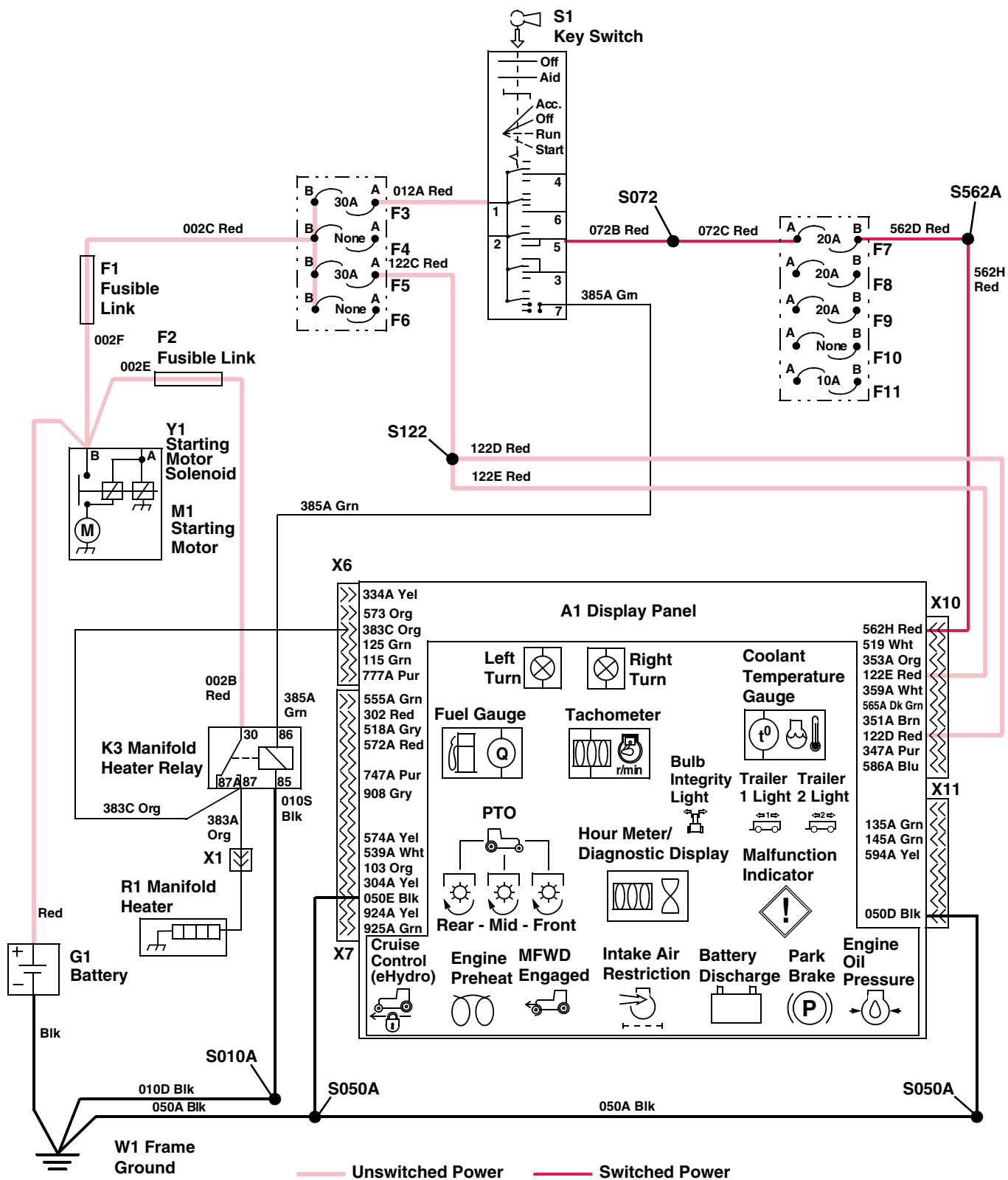
F10— Not Used
 F11— Fuse 10A
 G1—Battery
 K3—Manifold Heater Relay
 M1—Starting Motor
 R1—Manifold Heater
 S1—Key Switch
 W1—Frame Ground

X1—W1 Main Wiring
 Harness-to-R1 Manifold
 Heater
 X6— W1 Main Wiring
 Harness-to-A1 Display Panel
 X7— W1 Main Wiring
 Harness-to-A1 Display Panel

X10— W1 Main Wiring
 Harness-to-A1 Display
 Panel
 X11— W1 Main Wiring
 Harness-to-A1 Display
 Panel
 Y1— Starting Motor Solenoid

KN52281,100440F -19-02NOV12-2/2

Manifold Heater and Indicator Light Circuit Electrical Schematic—MY13



LVAL38724 —UN—17JAN13

Continued on next page

KN52281,1004410 -19-10DEC12-1/2

A1—Display Panel
F1—Fusible Link
F2—Fusible Link
F3—Fuse 30A
F4—Not Used
F5—Fuse 30A
F6—Not Used
F7—Fuse 20A
F8—Fuse 20A
F9—Fuse 20A

F10— Not Used
F11— Fuse 10A
G1—Battery
K3—Manifold Heater Relay
M1—Starting Motor
R1—Manifold Heater
S1—Key Switch
W1—Frame Ground

X1—W1 Main Wiring
Harness-to-R1 Manifold
Heater
X6—W1 Main Wiring
Harness-to-A1 Display Panel
X7—W1 Main Wiring
Harness-to-A1 Display Panel

X10— W1 Main Wiring
Harness-to-A1 Display
Panel
X11— W1 Main Wiring
Harness-to-A1 Display
Panel
Y1—Starting Motor Solenoid

KN52281,1004410 -19-10DEC12-2/2

Manifold Heater and Indicator Light Circuit Diagnosis

Test Procedure A

Test Conditions:

- Key switch in the run position, engine not running.
- Key switch pushed in to the aid position.
- Display panel is powered on. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

KN52281,1004411 -19-02NOV12-1/7

Manifold Heater Circuit

KN52281,1004411 -19-02NOV12-2/7

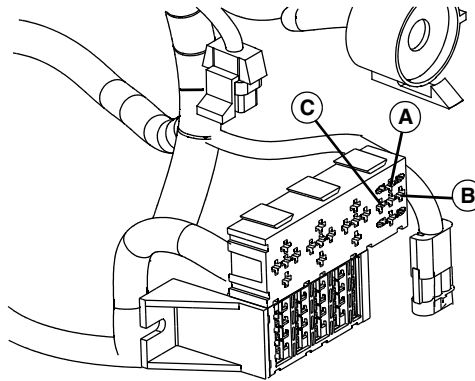
Step 1

Disconnect X1 connector to the manifold heater. Is battery voltage present at X1 connector, 383 Org wire and is the engine preheat light illuminated?

YES: Connect X1 connector. Test manifold heater.
YES: Engine preheat light circuit is functional.
NO: Test manifold heater relay. Check 383 Org wire and connections.
NO: Engine preheat light—Go to step (5) to continue test.

KN52281,1004411 -19-02NOV12-3/7

Step 2



LVAL11609 —UN—02NOV10

A—K3 Manifold Heater Relay Terminal 30, 002B Red Wire
B—K3 Manifold Heater Relay Terminal 86, 385 Grn Wire
C—K3 Manifold Heater Relay Terminal 85, 010S Blk Wire

Remove K3 manifold heater relay. Is battery voltage present at K3 manifold heater relay terminal 30, 002B Red wire (A)?

YES: Go to next step.

NO: Test power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

Continued on next page

KN52281,1004411 -19-02NOV12-4/7

Step 3

Is battery voltage present at K3 manifold heater relay terminal 86, 385 Grn wire (B).

YES: Go to next step.
NO: Test key switch.
Check 385A, 385B, and 385C Grn wires and connections.

KN52281,1004411 -19-02NOV12-5/7

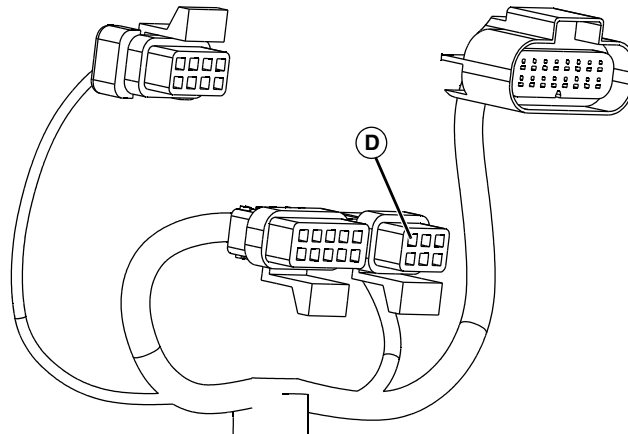
Step 4

Is continuity to ground present at K3 manifold heater relay terminal 85, 010S Blk wire (C)?

YES: Install manifold heater relay. Go to next step.
NO: Check 010 series Blk wires and connections to ground.

KN52281,1004411 -19-02NOV12-6/7

Step 5



LVAL11610—UN—02NOV10

D—X6 Connector Terminal C, 385A Grn Wire

Disconnect X6 connector at the display panel. Is battery voltage present at X6 connector, terminal C, 385A Grn wire (D)?

YES: Replace display panel.

NO: Test key switch.
Check 385 series Grn wires and connections.

KN52281,1004411 -19-02NOV12-7/7

**Manifold Heater and Indicator Light Circuit
Diagnosis—MY13**

Test Procedure A

Test Conditions

- Key switch in RUN position, engine not running.
- Key switch pushed in to AID position.
- Display panel powered up. (See Power Circuit Diagnosis—MY13—NA.)

KN52281,1004412 -19-21JAN13-1/7

Manifold Heater Circuit

Continued on next page

KN52281,1004412 -19-21JAN13-2/7

Step 1

Disconnect X2 connector to the manifold heater. Is battery voltage present at X2 connector, 383A Org wire and is the engine preheat light illuminated?

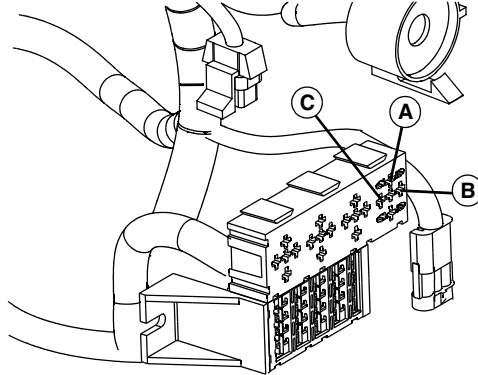
YES: Connect X2 connector. Test manifold heater.

YES: Engine preheat light—Go to step (5) to continue test.

NO: Test manifold heater relay. Go to next step.

KN52281,1004412 -19-21JAN13-3/7

Step 2



LVAL11609 —UN— 02NOV10

A—K3 Manifold Heater Relay Terminal 30, 002B Red Wire

B—K3 Manifold Heater Relay Terminal 86, 385A Grn Wire

C—K3 Manifold Heater Relay Terminal 85, 010S Blk Wire

Remove K4 manifold heater relay. Is battery voltage present at K3 manifold heater relay terminal 30, 002B Red wire (A)?

YES: Go to next step.

NO: Test power circuit.
(See Power Circuit
Diagnosis—MY13—NA.)

KN52281,1004412 -19-21JAN13-4/7

Step 3

Is battery voltage present at K3 manifold heater relay terminal 86, 385A Grn wire (B).

YES: Go to next step.

NO: Test key switch.
Check 385A Grn wire and connections.

KN52281,1004412 -19-21JAN13-5/7

Step 4

Is continuity to ground present at K3 manifold heater relay terminal 85, 010S Blk wire (C)?

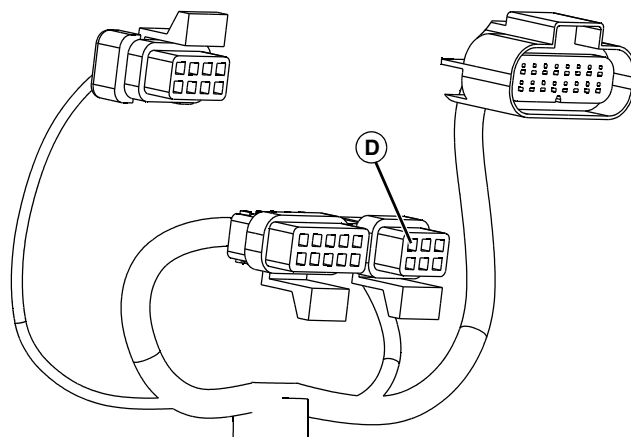
YES: Install manifold heater relay. Go to next step.

NO: Check 010 series Blk wires and connections to ground.

Continued on next page

KN52281,1004412 -19-21JAN13-6/7

Step 5



LVAL11610—UN—02NOV10

D—X6 Connector Terminal C, 383C Org Wire

Disconnect X6 connector at the display panel. Is battery voltage present at X6 connector, terminal C, 383C Org wire (D)?

YES: Replace display panel.

NO: Test key switch.
Check 383 series Org wires and connections.

KN52281,1004412 -19-21JAN13-7/7

Fuel Supply/Engine Shutoff Circuit Operation—NA

Function:

To start or stop the supply of fuel to the engine.

To cut power to the fuel shutoff solenoid and stop the machine engine when desired or in an unsafe operating condition.

Operating Conditions (Cranking):

- PTO(s) off,
- Transmission in neutral (PRT)
- Key switch in the start position

Operating Conditions (Engine on, Operator ON Seat):

- Key switch in the run position
- Operator on seat
- PTO(s) off or on
- Transmission in any gear (PRT)

Operating Conditions (Engine On, Operator OFF Seat):

- Key switch in the run position
- Park brake locked
- Transmission in neutral (PRT)
- PTO(s) off, and then
- Operator may leave seat.

Operating Conditions (Engine On, Operator OFF Seat, Rear PTO Engaged):

- Key switch in the run position
- Park brake locked
- Transmission in neutral (PRT)
- Mid PTO off
- Operator may leave seat, and then
- Rear PTO can be on

Engine MUST STOP when:

- Operator places the key switch in the off position

or

- PTO(s) on, and
- Operator gets out of seat (if off seat PTO logic is not engaged),

or (PRT)

- Transmission is in gear, and
- Operator gets out of seat,

Theory of Operation—Fuel Supply Logic:

The fuel system is designed to inject fuel into the piston cylinders where heat from compression ignites the fuel and air mixture. Fuel is provided to the engine when the fuel shutoff solenoid is energized.

A normal higher in-rush current used to energize the fuel shutoff solenoid coil opens the spring loaded fuel valve. Once energized, the current required to operate the fuel

shutoff solenoid is provided at a lower rate to hold-in the fuel valve allowing fuel to the engine. The current to the fuel shutoff solenoid pull-in coil is then removed.

This fuel shutoff solenoid pull-in coil circuit causes the display panel to provide power to the fuel relay. The fuel relay will energize, closing its contacts to provide current from the unswitched power circuit wire 002D Red to the 329 Wht wire. This energizes the pull-in coil of the fuel shutoff solenoid.

After a short delay, the display panel will provide an output on the 302 Red wire to the Y2 fuel shutoff solenoid hold-in coil. At the same time, the display panel will remove the output to the K1 fuel relay over the 304 Yel wire.

A ground path for the fuel shutoff solenoid is provided through the 010N and 010P Blk wires.

When the key switch is placed in either the run or start positions, current from the switched power circuit is provided to the A1 display panel through either the S6 seat switch (on seat) or the S3 rear PTO switch (off) and the S10 transmission neutral switch (PRT—neutral).

Fuel is supplied to the engine by the M2 fuel pump over the 562F Red wire when the S1 key switch is placed in either the start or run position. Ground for this circuit is through the 010B and 050A Blk wires.

Theory of Operation—Engine Shutoff:

When the operator places the key switch in the off position or if an unsafe condition is created, the engine will stop by having the fuel supply to the engine shut off.

The fuel supply is shut off when voltage to the Y2 fuel shutoff solenoid hold-in coil is removed.

Power to the Y2 fuel shutoff solenoid pull-in and hold-in coils (and K1 fuel relay) is the result of an output from the A1 display panel, and is controlled by several different input circuits. The different input circuits allow for a variety of operating conditions to exist and maintain fuel supply to the engine.

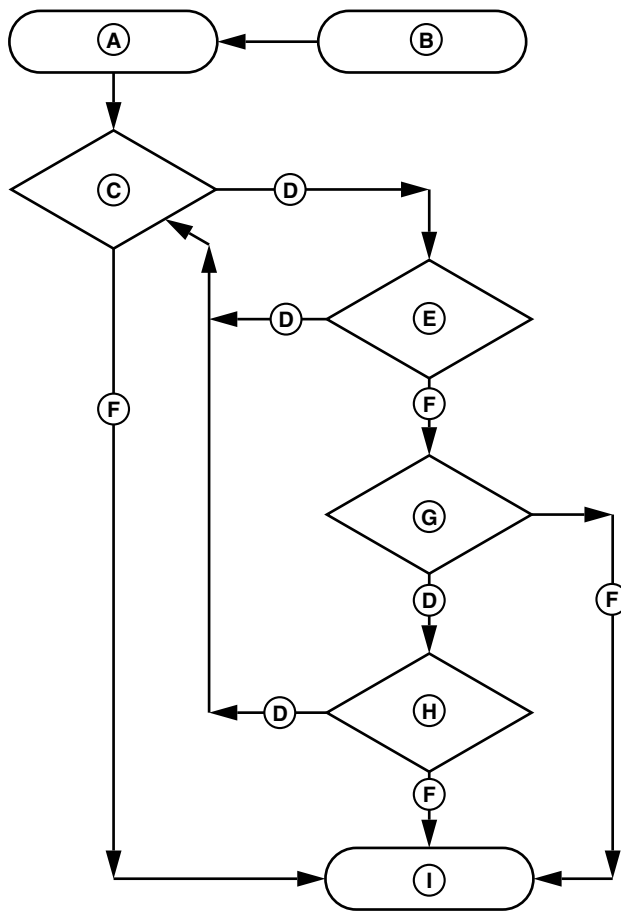
Engine on, Operator ON Seat Logic:

The seat switch is the main and most direct circuit to provide input to the A1 display panel that will provide an output to the Y2 fuel shutoff solenoid coil.

This on seat logic circuit provides voltage to the fuel shutoff solenoid hold-in coil for normal operator on seat operation of the machine.

Power is provided through the key switch, 072C Red wire, F7 fuse, 562D, 562N, and 562E Red wires, S6 seat switch (operator on seat), 539C and 539A Wht wires, A1 display panel (X7 connector, terminal L).

The display panel will then provide an output on the 304 Red wire to the K1 fuel relay to energize the relay and close its contacts. This in turn will provide voltage to the Y2 fuel shutoff solenoid pull-in coil.



A—Place Key Switch in Run Position.
 B—Fuel Solenoid Off
 C—Operator On Seat?
 D—No
 E—Transmission in Neutral?

F—Yes
 G—PTOs Off?
 H—Off Seat PTO Logic On?
 I— Fuel Solenoid On

in neutral, without the operator in the seat. This in turn will provide voltage to the Y2 fuel shutoff solenoid pull-in coil.

After a short delay, the display panel will provide an output on the 302 Red wire to the Y2 fuel shutoff solenoid hold-in coil. At the same time, the display panel will remove the output to the K1 fuel relay over the 304 Yel wire, de-energizing the fuel shutoff solenoid pull-in coil.

Engine On, Operator OFF Seat, Rear PTO Engaged Logic (Off Seat PTO Logic)

To operate a machine with the rear PTO engaged and allow the operator to leave the seat requires that the Off Seat PTO Logic be activated. The off seat PTO logic is activated and deactivated automatically as the operator uses different functions of the machine.

To activated the off seat PTO logic, the A1 display panel requires proper input signals from the following circuits during the following conditions:

Input Circuit	Operating Condition
Seat switch	Operator on seat,
Rear PTO switch	Off position
Park brake switch	Park brake locked
Transmission neutral switch (PRT), or W4 jumper (eHydro™/Auto HST)	Transmission in neutral
W3 Mid PTO jumper, or optional S9 Mid PTO switch	S9 Mid PTO switch off (if equipped)
Alternator	Engine running

After a short delay, the display panel will provide an output on the 302 Red wire to the Y2 fuel shutoff solenoid hold-in coil. At the same time, the display panel will remove the output to the K1 fuel relay over the 304 Yel wire.

Engine On, Operator OFF Seat Logic:

The S3 rear PTO switch in combination with the S10 transmission neutral switch (PRT), or W4 jumper (eHydro™), is the second path to provide power to the K1 fuel relay coil and the Y2 fuel shutoff solenoid.

The rear PTO switch in combination with the transmission neutral switch (PRT), or W4 jumper (eHydro™), provides power to the fuel circuit. Power is provided from the key switch to the 072C Red wire, F7 fuse, 562D, 562A, 562N and 562J Red wires.

The 562A Red wire provides power to the S3 rear PTO switch (PTO off), 573 Org wire, A1 display panel (X7 connector, terminal K).

At the same time the 562J Red wire provides power to the S10 transmission neutral switch (PRT), W4 jumper (eHydro™), 519 Wht wire, A1 display panel (X10 connector, terminal B).

The display panel will then provide an output on the 304 Red wire to the K1 fuel relay to energize the relay and close its contacts, if the PTO is off and the transmission is

Once the off seat PTO logic has been activated, the operator may leave the seat and then engage the rear PTO. With the mid PTO engaged, the operator must remain on the seat in order for the engine to remain running.

Except for the seat switch, if any of the other inputs change once the operator has left the seat and engaged the rear PTO, the engine will shut off.

If the operator returns to the seat, the engine will continue to run with the rear PTO engaged, however the off seat PTO logic will be deactivated and the engine will shut off if the operator leaves the seat, unless the off seat PTO logic is activated again.

The A1 display panel requires 4 constant and 2 changing inputs to operate the rear PTO with operator off the seat. 5 inputs supply battery voltage and 1 input supplies a frequency signal to the display panel to activate the off seat PTO logic. The changing inputs are from the seat switch indicating that the operator has left the seat, and the rear PTO switch indicating that the operator has engaged the rear PTO.

Continued on next page

KN52281,1004413 -19-08JAN13-2/4

The switched power circuit provides power to the display panel through the following circuits:

- The 562J Red wire provides power to the S10 transmission neutral switch (PRT), or W4 jumper (eHydro™/Auto HST), 519 Wht wire, A1 display panel (X10 connector, terminal B).
- The 562B Red wire provides power to the S8 park brake switch (park brake locked), 586 Blu wire, A1 display panel (X10 connector, terminal K).
- The 562L Red wire provides power to the X8 connector, (S9 Mid PTO switch, if equipped), 594 Yel wire, A1 display panel (X11 connector, terminal D).
- The frequency input is a result of the engine running and is supplied by the G2 alternator from the 325C and 325B Grn wires to the A1 display panel (X10 connector, terminal F).
- The 562E Red wire provides power to the S6 seat switch (operator on seat), 539C and 539A Wht wires, A1 display panel (X7 connector, terminal L).

- The 562A Red wire provides power to the S3 rear PTO switch (PTO off), 573 Org wire, A1 display panel (X7 connector, terminal K).

Once the inputs have been established, the operator may leave the seat, removing power from X7 connector, terminal L and engage the rear PTO removing power from X7 connector, terminal K.

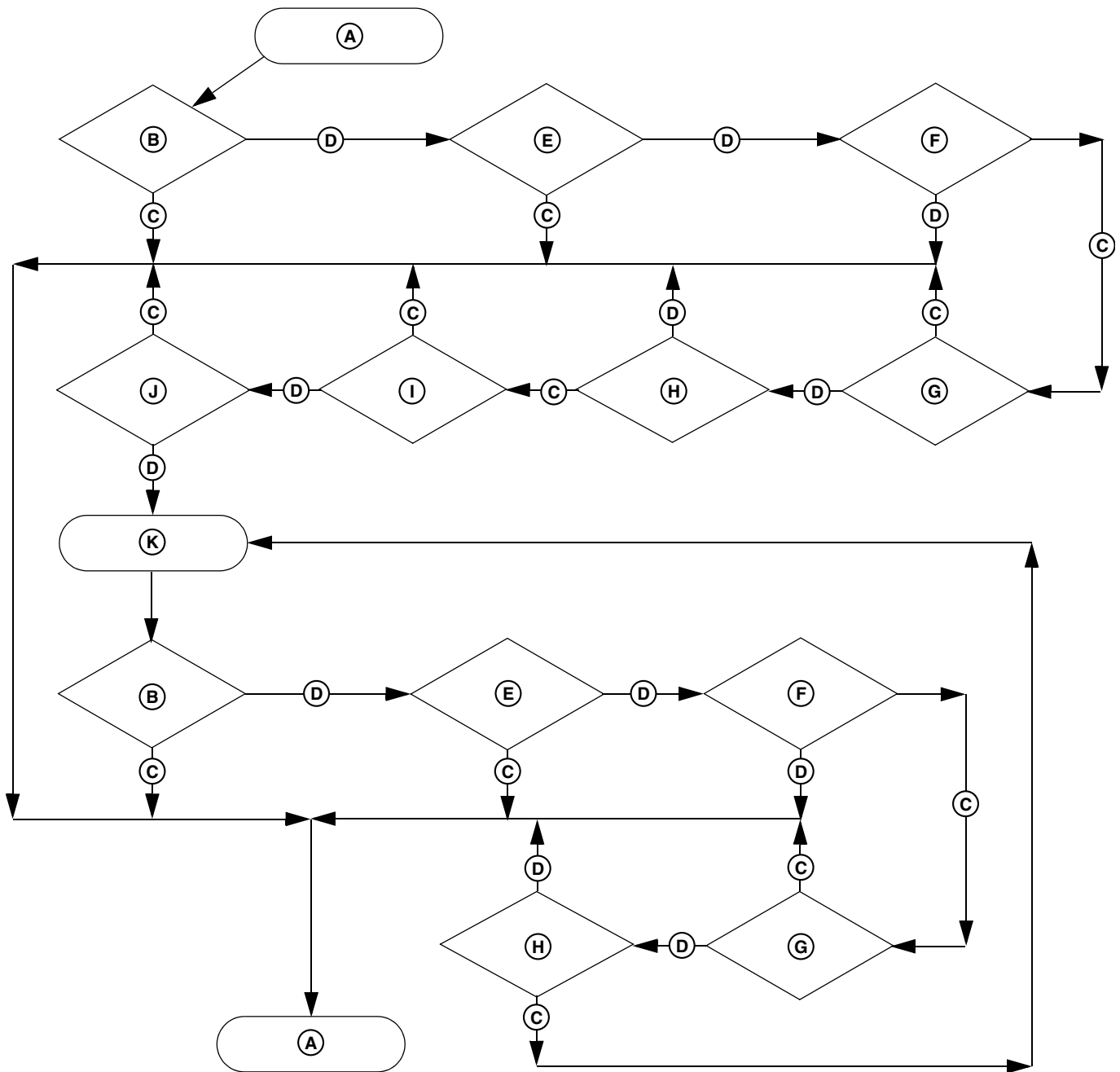
The rear PTO will remain engaged until the operator disengages the rear PTO, or unlocks the park brake, or engages the mid PTO, or places the transmission in gear (PRT), or places the key switch in either the off or start positions.

If the operator returns to the seat, the rear PTO will remain engaged, however, the off seat PTO logic will be deactivated.

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KN52281,1004413 -19-08JAN13-3/4



A—Off Seat PTO Logic Off
 B—Mid PTO Off?
 C—No
 D—Yes
 E—Park Brake Locked?

F—Operator On Seat?
 G—Transmission in Neutral?
 H—Engine Crank Signal On?

I—Rear PTO Off?
 J—Engine Cranked at Least Once.
 K—Off Seat PTO Logic On

LVAL17476 —UN—29APR11

KN52281,1004413 -19-08JAN13-4/4

Fuel Supply/Engine Shutoff Circuit Operation—MY13

Function

To start or stop the supply of fuel to the engine.

To cut power to the fuel shutoff solenoid and stop the machine engine when desired or in an unsafe operating condition.

Operating Conditions (Cranking)

- PTO(s) off,
- Transmission in neutral (PRT)
- Key switch in the START position

Operating Conditions (Engine on, Operator On Seat)

- Key switch in RUN position
- Operator on seat
- PTO(s) off or on
- Transmission in any gear (PRT)

Operating Conditions (Engine On, Operator Off Seat)

- Key switch in RUN position
- Park brake locked
- Transmission in neutral (PRT)
- PTO(s) off, and then
- Operator may leave seat.

Operating Conditions (Engine On, Operator Off Seat, Rear PTO Engaged)

- Key switch in RUN position
- Park brake locked
- Transmission in neutral (PRT)
- Mid PTO off
- Operator may leave seat, and then
- Rear PTO can be on

Engine MUST STOP when

- Operator places the key switch in OFF position

or

- PTO(s) on, and

- Operator gets out of seat (if off-seat PTO logic is not engaged)

or (PRT)

- Transmission is in gear, and
- Operator gets out of seat

Theory of Operation—Fuel Supply Logic

The fuel system is designed to inject fuel into the piston cylinders where heat from compression ignites the fuel and air mixture. Fuel is provided to the engine when the fuel shutoff solenoid is energized.

A normal higher in-rush current used to energize the fuel shutoff solenoid coil opens the spring loaded fuel valve. Once energized, the current required to operate the fuel shutoff solenoid is provided at a lower rate to hold-in the fuel valve allowing fuel to the engine. The current to the fuel shutoff solenoid pull-in coil is then removed.

This fuel shutoff solenoid pull-in coil circuit causes the display panel to provide power to the fuel relay. The fuel relay will energize, closing its contacts to provide current from the unswitched power circuit wire 002D Red to the 329 Wht wire. This energizes the pull-in coil of the fuel shutoff solenoid.

After a short delay, the display panel will provide an output on the 302 Red wire to the Y2 fuel shutoff solenoid hold-in coil. At the same time, the display panel will remove the output to the K1 fuel relay over the 304A Yel wire.

A ground path for the fuel shutoff solenoid is provided through the 010N and 010P Blk wires.

When the key switch is placed in either the RUN or START positions, current from the switched power circuit is provided to the A1 display panel through the S6 seat switch (on seat) and the S10 transmission neutral switch (PRT—neutral).

Fuel is supplied to the engine by the M2 fuel pump over the 562F Red wire when the S1 key switch is placed in either the START or RUN position. Ground for this circuit is through the 010B and 050A Blk wires.

The following flow chart is a diagram of the display panel fuel supply circuit logic.

Theory of Operation—Engine Shutoff

When the operator places the key switch in the OFF position or if an unsafe condition is created, the engine will stop by having the fuel supply to the engine shut off.

The fuel supply is shut off when voltage to the Y2 fuel shutoff solenoid hold-in coil is removed.

Power to the Y2 fuel shutoff solenoid pull-in and hold-in coils (and K1 fuel relay) is the result of an output from the A1 display panel, and is controlled by several different input circuits. The different input circuits allow for a variety of operating conditions to exist and maintain fuel supply to the engine.

Engine on, Operator ON Seat Logic

The seat switch is the main and most direct circuit to provide input to the A1 display panel that will provide an output to the Y2 fuel shutoff solenoid coil.

This on seat logic circuit provides voltage to the fuel shutoff solenoid hold-in coil for normal operator on seat operation of the machine.

Power is provided through the key switch, 072B Red wire, F7 fuse, 562D, 562N, and 562E Red wires, S6 seat switch (operator on seat), 539C and 539A Wht wires, A1 display panel (X7 connector, terminal L).

The display panel will then provide an output on the 304A Yel wire to the K1 fuel relay to energize the relay and close its contacts. This in turn will provide voltage to the Y2 fuel shutoff solenoid pull-in coil.

After a short delay, the display panel will provide an output on the 302 Red wire to the Y2 fuel shutoff solenoid hold-in coil. At the same time, the display panel will remove the output to the K1 fuel relay over the 304A Yel wire.

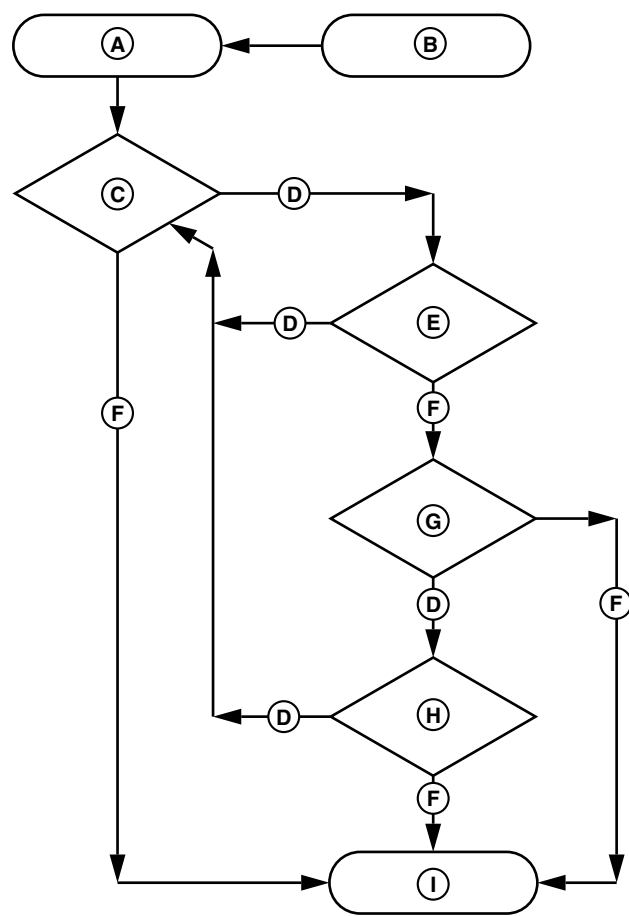
Engine On, Operator Off-Seat Logic

The S3 rear PTO switch in combination with the S10 transmission neutral switch (PRT), or W4 jumper (eHydro™), is the second path to provide power to the K1 fuel relay coil and the Y2 fuel shutoff solenoid.

The rear PTO switch in combination with the transmission neutral switch (PRT), or W4 jumper (eHydro™), provides power to the fuel circuit. Power is provided from the key switch to the 072B Red wire, F7 fuse, 562D, 562A, 562N and 562J Red wires.

The 562A Red wire provides power to the S3 rear PTO switch (PTO on), 574A Yel wire, A1 display panel (X7 connector, terminal K).

At the same time the 562J Red wire provides power to the S10 transmission neutral switch (PRT), W4 jumper (eHydro™), 519 Wht wire, A1 display panel (X10 connector, terminal B).



A—Place Key Switch in RUN Position.
 B—Fuel Solenoid Off
 C—Operator On Seat?
 D—No
 E—Transmission in Neutral?
 F—Yes
 G—PTOs Off?
 H—Off-Seat PTO Logic On?
 I— Fuel Solenoid On

The display panel will then provide an output on the 304A Yel wire to the K1 fuel relay to energize the relay and close its contacts, if the PTO is off and the transmission is in neutral, without the operator on the seat. This in turn will provide voltage to the Y2 fuel shutoff solenoid pull-in coil.

After a short delay, the display panel will provide an output on the 302 Red wire to the Y2 fuel shutoff solenoid hold-in coil. At the same time, the display panel will remove the output to the K1 fuel relay over the 304A Yel wire, de-energizing the fuel shutoff solenoid pull-in coil.

Engine On, Operator Off Seat, Rear PTO Engaged Logic (Off-Seat PTO Logic)

To operate a machine with the rear PTO engaged and allow the operator to leave the seat requires that the off-seat PTO logic be activated. The off-seat PTO logic is activated and deactivated automatically as the operator uses different functions of the machine.

Continued on next page

KN52281,1004414 -19-21JAN13-2/4

To activated the off-seat PTO logic, the A1 display panel requires proper input signals from the following circuits during the following conditions:

Input Circuit	Operating Condition
S6 Seat switch	Operator on seat,
S3 Rear PTO switch	OFF position
S8 Park brake switch	Park brake locked
S10 Transmission neutral switch (PRT), or W4 jumper (eHydro™/Auto HST)	Transmission in neutral
W3 Mid PTO jumper, or optional S9 Mid PTO sensing switch	S9 Mid PTO sensing switch off (if equipped)
G2 Alternator via A2 electronic drive controller	Engine running

Once the off-seat PTO logic has been activated, the operator may leave the seat and then engage the rear PTO by pulling the S3 rear PTO switch to the ON position. If the mid PTO is engaged, the operator must remain on the seat for the engine to remain running.

Except for the seat switch, if any of the other inputs change once the operator has left the seat and engaged the rear PTO, the engine will stop.

If the operator returns to the seat, the engine will continue to run with the rear PTO engaged. However, the off-seat PTO logic will deactivate and the engine will stop if the operator leaves the seat, unless the off-seat PTO logic is activated again.

The A1 display panel requires four constant inputs and two changing inputs to operate the rear PTO with operator off the seat. Five inputs supply battery voltage and one input supplies a frequency signal to the display panel to activate the off-seat PTO logic. The two changing inputs come from the following components:

- S6 seat switch (indicates that the operator has left the seat).
- S3 rear PTO switch (indicates that the operator has engaged the rear PTO).

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The switched power circuit provides power to the display panel through the following circuits:

- The 562J Red wire provides power to the S10 transmission neutral switch (PRT), or W4 jumper (eHydro™/Auto HST), 519 Wht wire, A1 display panel (X10 connector, terminal B).
- The 562B Red wire provides power to the S8 park brake switch (park brake locked), 586A Blu wire, A1 display panel (X10 connector, terminal K).
- The 562L Red wire provides power to the X8 connector, (S9 mid PTO sensing switch, if equipped), 594A Yel wire, A1 display panel (X11 connector, terminal D).
- The frequency input is a result of the engine running and is supplied by the A2 electronic drive controller to the A1 display panel (X6 connector, terminal A).
- The 562E Red wire provides power to the S6 seat switch (operator on seat), 539C and 539A Wht wires, A1 display panel (X7 connector, terminal L).
- The 562A Red wire provides power to the S3 rear PTO switch (PTO on), 574A Yel wire, A1 display panel (X7 connector, terminal K).

Once the inputs have been established, the operator may leave the seat, removing power from X7 connector, terminal L and engage the rear PTO removing power from X7 connector, terminal K.

The rear PTO will remain engaged until the operator performs any of the following:

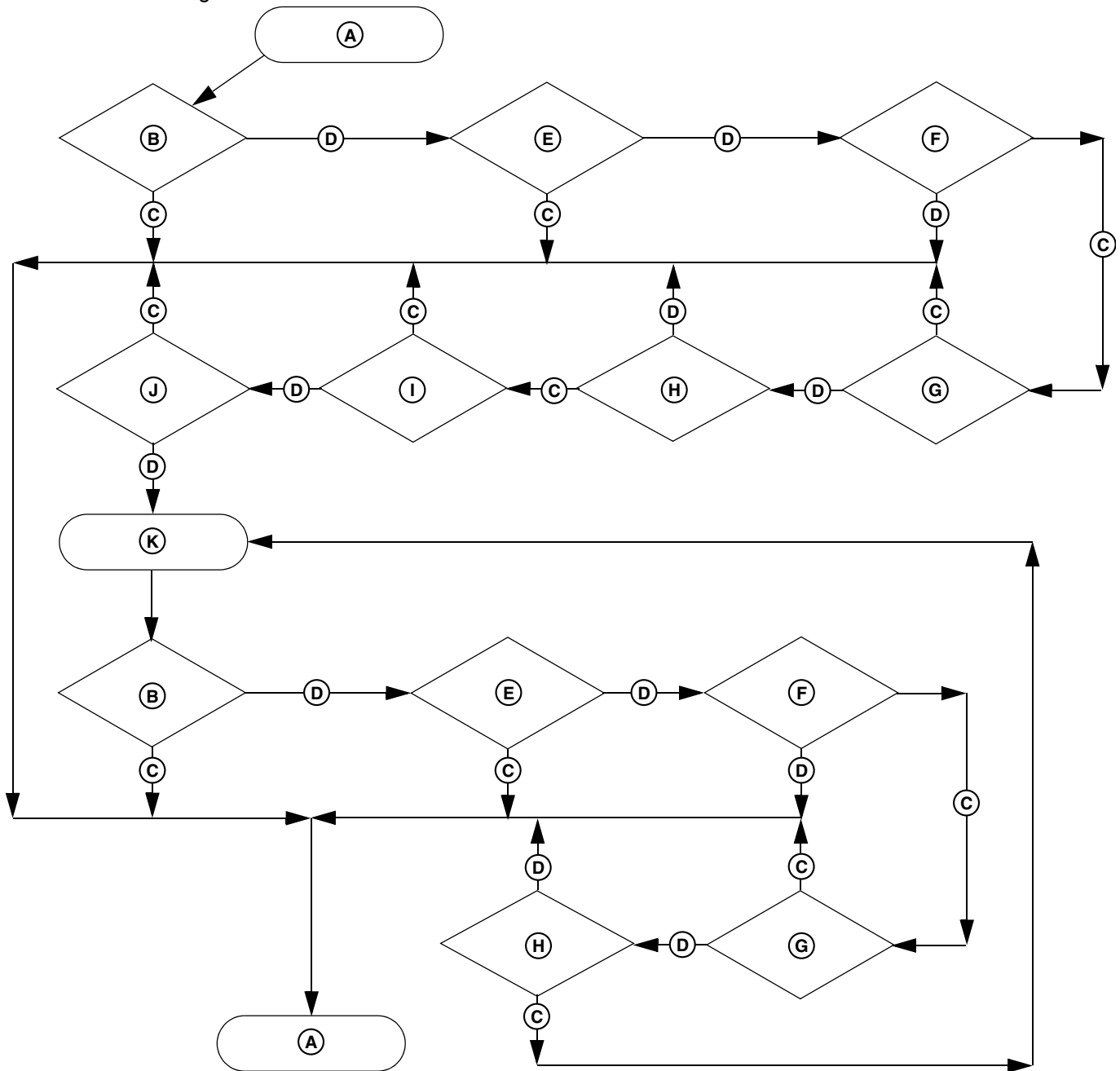
- Disengages the rear PTO.
- Unlocks the park brake.
- Engages the mid PTO.
- Places the transmission in gear (PRT).
- Places the key switch in either the OFF or START positions.

If the operator returns to the seat, the rear PTO will remain engaged, however, the off-seat PTO logic will be deactivated.

Continued on next page

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The following flow chart is a diagram of the display panel off-seat PTO circuit logic.



A—Off-Seat PTO Logic Off.
B—Mid PTO Off?
C—No
D—Yes
E—Park Brake Locked?

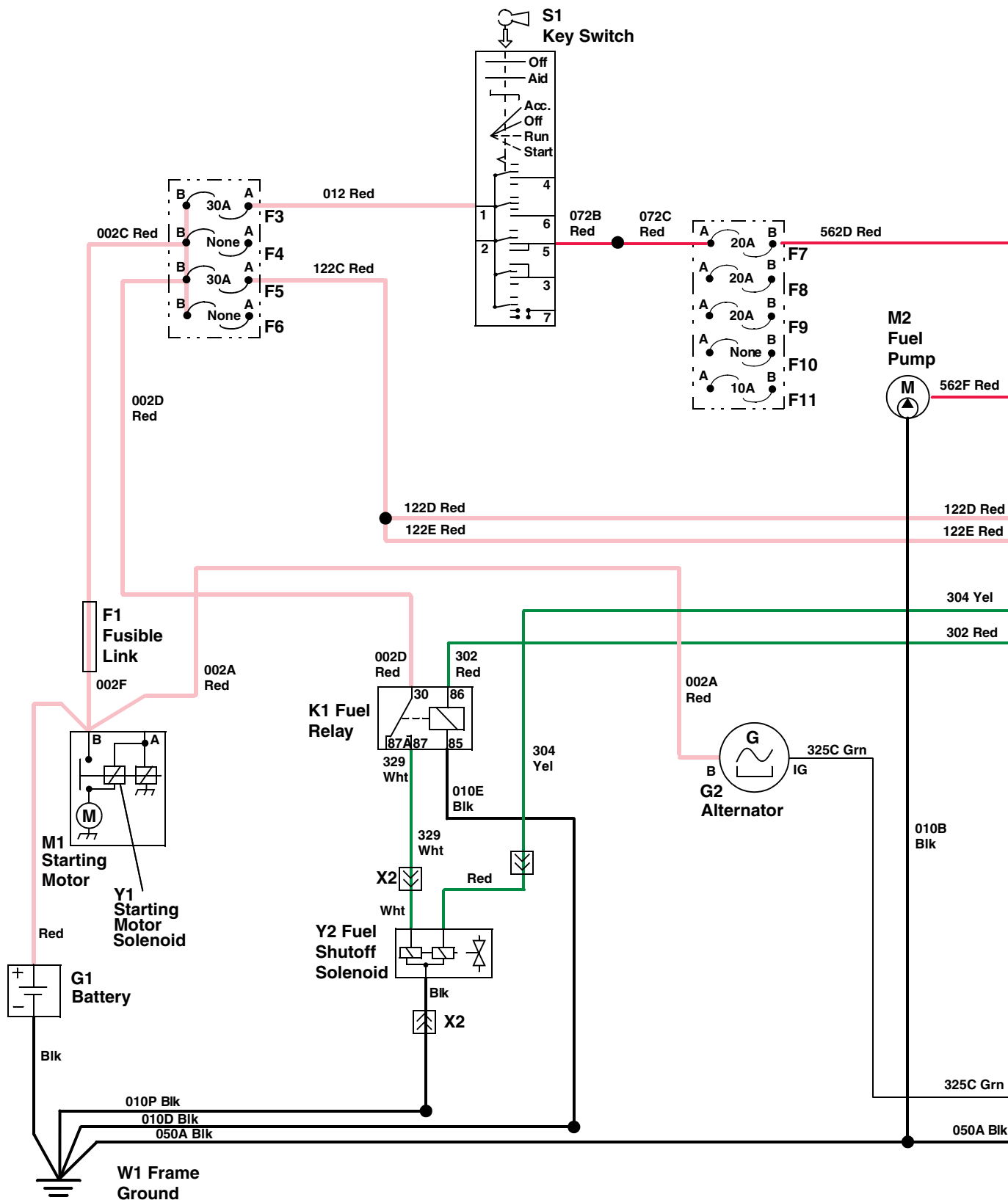
F—Operator On Seat?
G—Transmission in Neutral?
H—Engine Crank Signal On?

I—Rear PTO Off?
J—Engine Cranked at Least Once.
K—Off-Seat PTO Logic On.

LVAL17476 —UN—29APR11

KN52281,1004414 -19-21JAN13-4/4

Fuel Supply/Fuel Pump/Engine Shutoff Circuit Electrical Schematic—Pre MY08



LVAL11613 —UN—02NOV10

Continued on next page

KN52281,1004415 -19-02NOV12-1/4

F1— Fusible Link
F3— Fuse 30A
F4— Not Used
F5— Fuse 30A
F6— Not Used
F7— Fuse 20A
F8— Fuse 20A

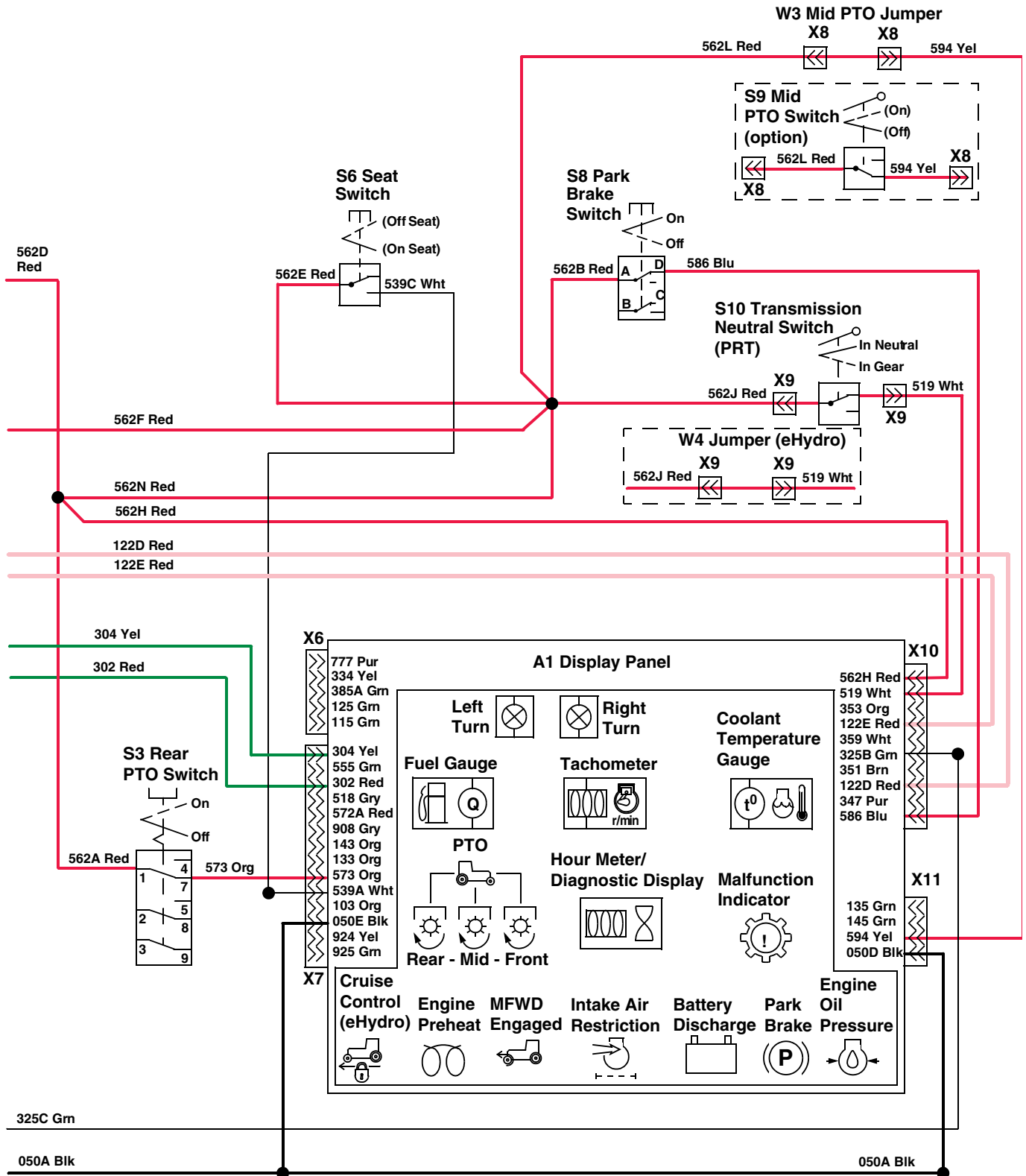
F9— Fuse 20A
F10— Not Used
F11— Fuse 10A
G1—Battery
G2—Alternator
K1—Fuel Relay
M1—Starting Motor

M2—Fuel Pump
S1—Key Switch
W1—Frame Ground
X2— W1 Main Wiring
Harness-to-Y2 Fuel Shutoff
Solenoid

Y1— Starting Motor Solenoid
Y2— Fuel Shutoff Solenoid

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KN52281,1004415 -19-02NOV12-2/4



LVAL11614—UN—02NOV10

Continued on next page

KN52281,1004415 -19-02NOV12-3/4

A1—Display Panel	W4—Jumper (eHydro™)	X8—W1 Main Wiring Harness to W3 Jumper Plug (standard), S9 Mid PTO Switch (optional)	X10— W1 Main Wiring Harness-to-A1 Display Panel
S3—Rear PTO Switch	X6— W1 Main Wiring Harness-to-A1 Display Panel	X9— W1 Main Wiring Harness to S10 Transmission Neutral Switch (PRT), W4 Jumper Plug (eHydro™)	X11— W1 Main Wiring Harness-to-A1 Display Panel
S6—Seat Switch	X7— W1 Main Wiring Harness-to-A1 Display Panel		
S8—Park Brake Switch			
S9—Mid PTO Switch (optional)			
S10— Transmission Neutral Switch (PRT)			
W3—Mid PTO Jumper (standard)			

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KN52281,1004415 -19-02NOV12-4/4

Fuel Supply/Fuel Pump/Engine Shutoff Circuit Electrical Schematic—MY08



KN52281,1004416 -19-02NOV12-1/4

F1— Fusible Link
F3— Fuse 30A
F4— Not Used
F5— Fuse 30A
F6— Not Used
F7— Fuse 20A
F8— Fuse 20A

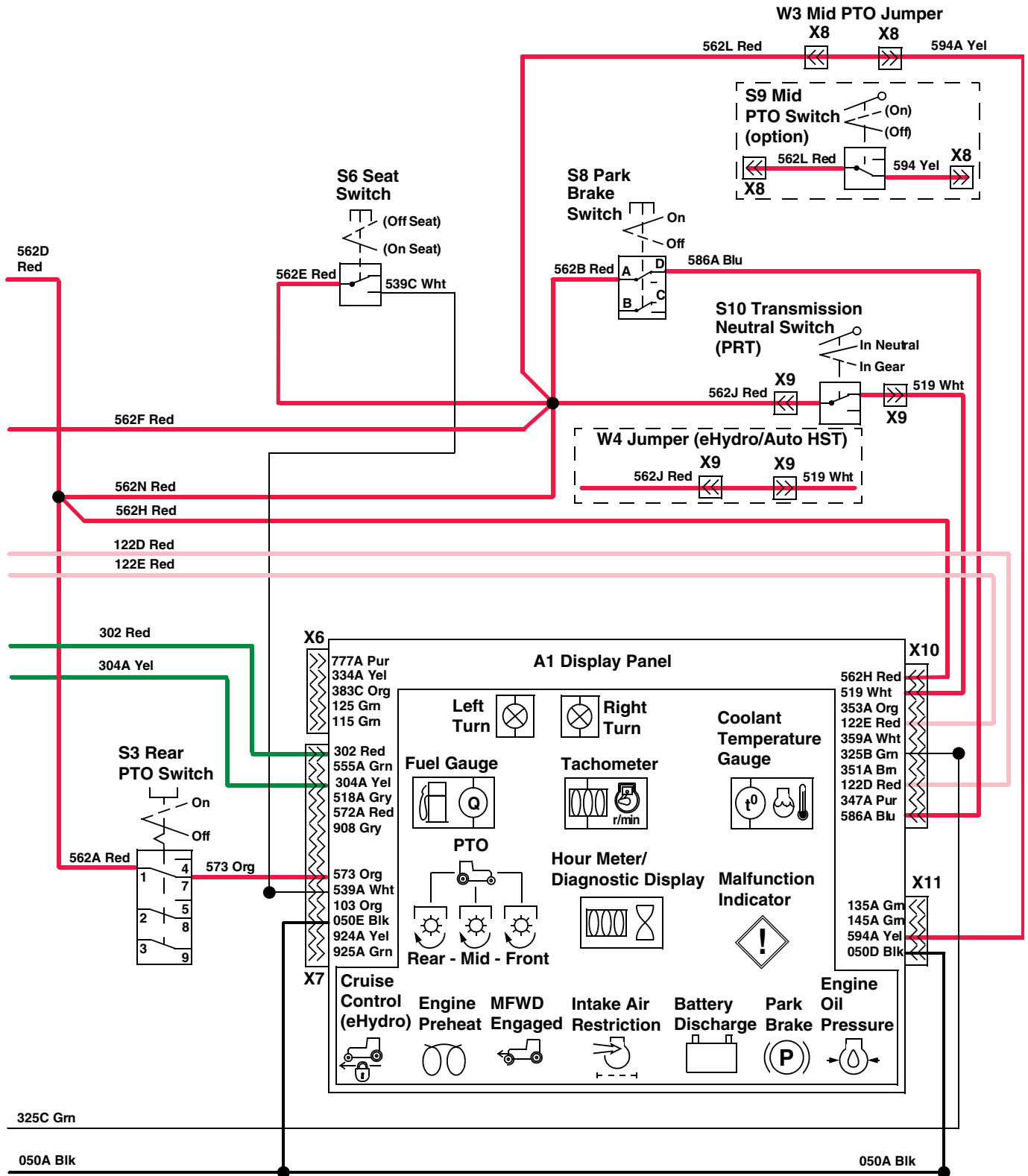
F9— Fuse 20A
F10— Not Used
F11— Fuse 10A
G1—Battery
G2—Alternator
K1—Fuel Relay
M1—Starting Motor

M2—Fuel Pump
S1—Key Switch
W1—Frame Ground
X2— W1 Main Wiring
Harness-to-Y2 Fuel Shutoff
Solenoid

Y1— Starting Motor Solenoid
Y2— Fuel Shutoff Solenoid

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KN52281,1004416 -19-02NOV12-2/4



LVAL11616—UN—02NOV10

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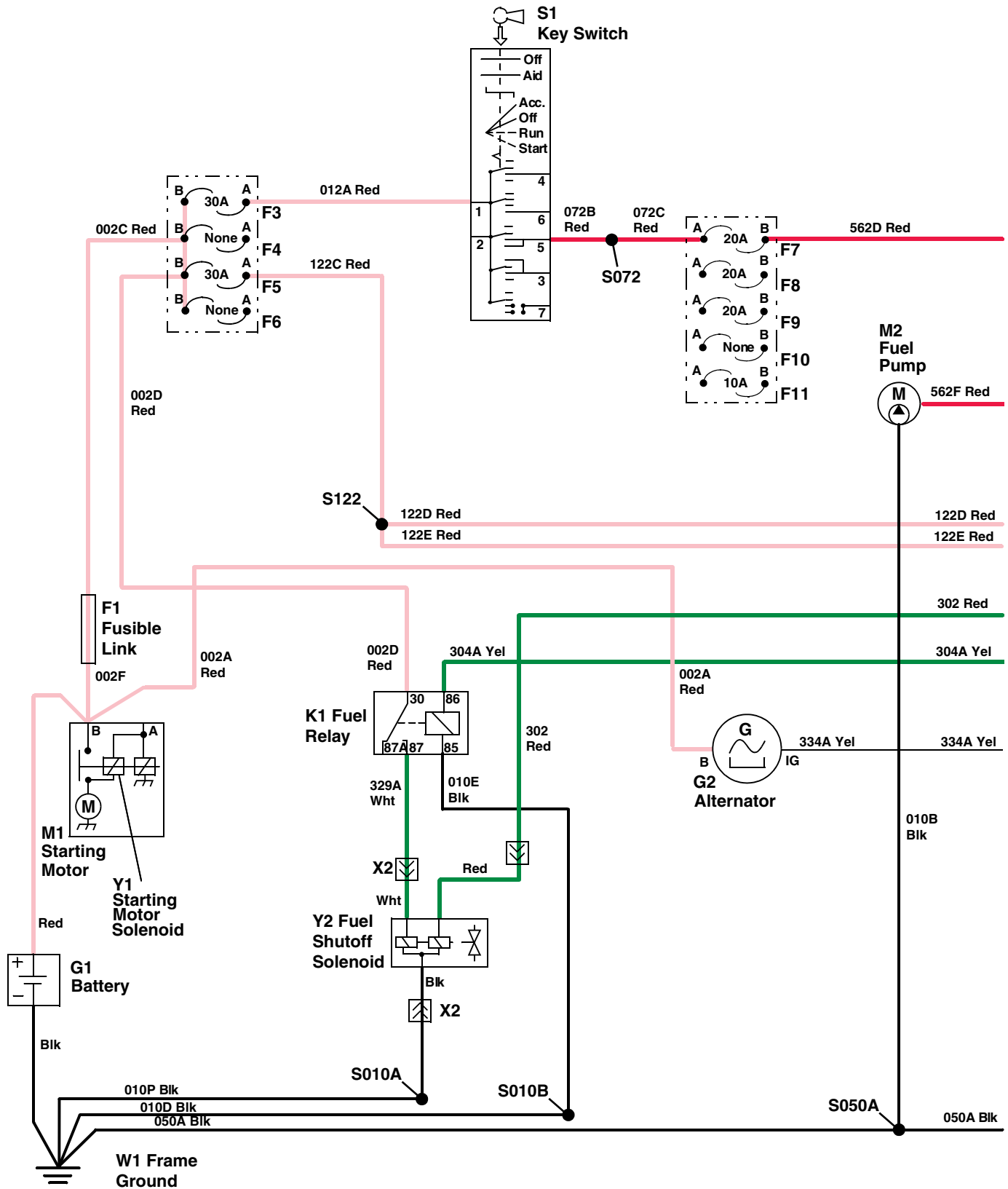
KN52281,1004416 -19-02NOV12-3/4

A1—Display Panel	W4—Jumper (eHydro™/Auto HST)	X8—W1 Main Wiring Harness to W3 Jumper Plug (standard), S9 Mid PTO Switch (optional)	X10— W1 Main Wiring Harness-to-A1 Display Panel
S3—Rear PTO Switch	X6—W1 Main Wiring Harness-to-A1 Display Panel	X9—W1 Main Wiring Harness to S10 Transmission Neutral Switch (PRT), W4 Jumper Plug (eHydro™/Auto HST)	X11— W1 Main Wiring Harness-to-A1 Display Panel
S6—Seat Switch	X7—W1 Main Wiring Harness-to-A1 Display Panel		
S8—Park Brake Switch			
S9—Mid PTO Switch (optional)			
S10— Transmission Neutral Switch (PRT)			
W3—Mid PTO Jumper (standard)			

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KN52281,1004416 -19-02NOV12-4/4

Fuel Supply/Fuel Pump/Engine Shutoff Circuit Electrical Schematic—MY13



Fuel Supply/Fuel Pump/Engine Shutoff Circuit Schematic—MY13 (1 of 2)

LVAL38725 —UN—16OCT12

Continued on next page

KN52281,1004417 -19-16JAN13-1/4

F1— Fusible Link
F3— Fuse 30A
F4— Not Used
F5— Fuse 30A
F6— Not Used
F7— Fuse 20A
F8— Fuse 20A

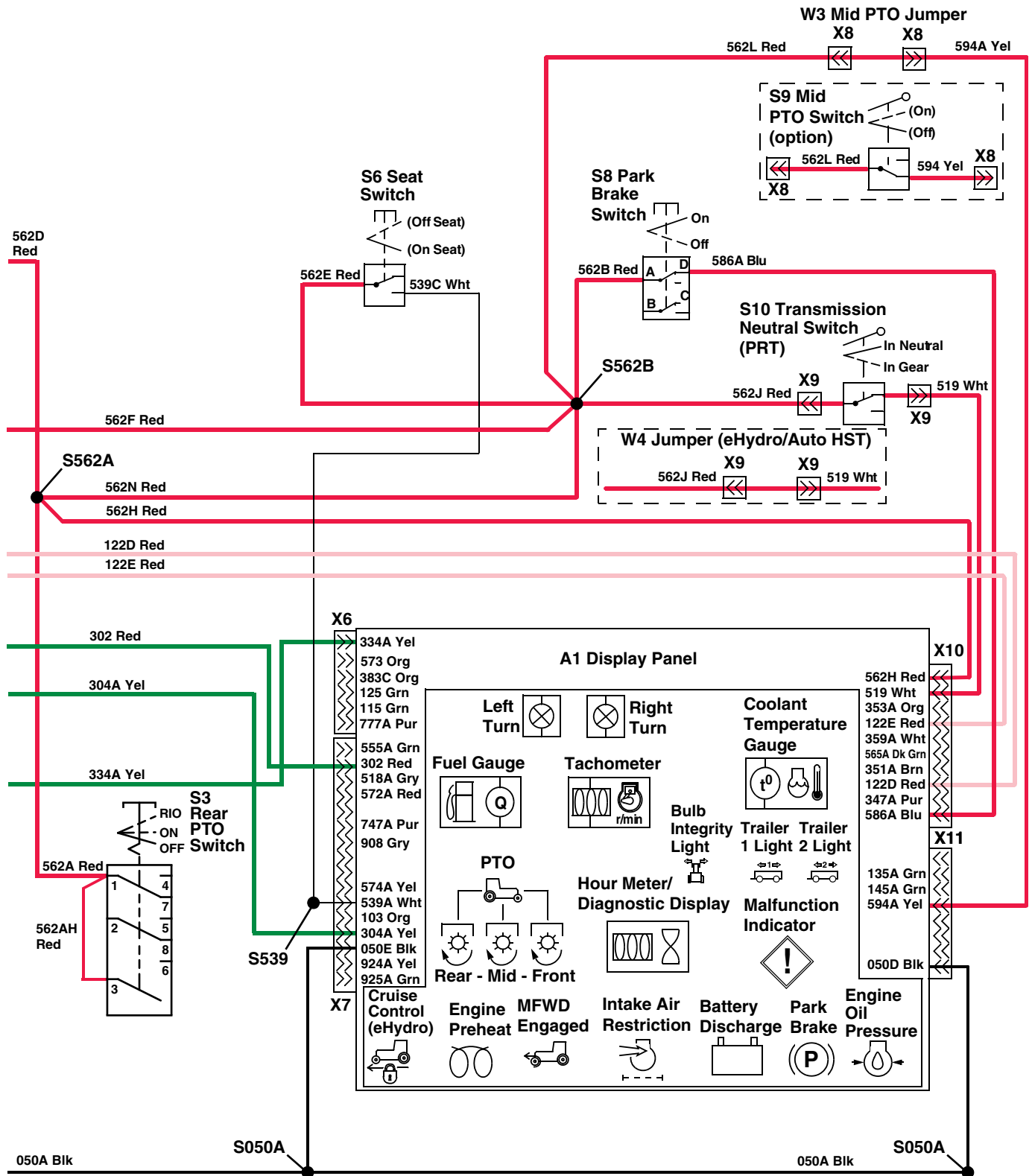
F9— Fuse 20A
F10— Not Used
F11— Fuse 10A
G1—Battery
G2—Alternator
K1—Fuel Relay
M1—Starting Motor

M2—Fuel Pump
S1—Key Switch
W1—Frame Ground
X2— W1 Main Wiring
Harness-to-Y2 Fuel Shutoff
Solenoid

Y1— Starting Motor Solenoid
Y2— Fuel Shutoff Solenoid

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KN52281,1004417 -19-16JAN13-2/4



Fuel Supply/Fuel Pump/Engine Shutoff Circuit Schematic—MY13 (2 of 2)

Continued on next page

KN52281,1004417 -19-16JAN13-3/4

A1—Display Panel
S3—Rear PTO Switch
S6—Seat Switch
S8—Park Brake Switch
S9—Mid PTO Sensing Switch (optional)
S10—Transmission Neutral Switch (PRT)
W3—Mid PTO Jumper (standard)

W4—Jumper (eHydro™/Auto HST)
X6—W1 Main Wiring Harness-to-A1 Display Panel
X7—W1 Main Wiring Harness-to-A1 Display Panel

X8—W1 Main Wiring Harness to W3 Jumper Plug (standard), S9 Mid PTO Sensing Switch (optional)
X9—W1 Main Wiring Harness to S10 Transmission Neutral Switch (PRT), W4 Jumper Plug (eHydro™/Auto HST)

X10—W1 Main Wiring Harness-to-A1 Display Panel
X11—W1 Main Wiring Harness-to-A1 Display Panel

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KN52281,1004417 -19-16JAN13-4/4

Fuel Supply/Engine Shutoff Circuit Diagnosis

Test Procedure A

Fault codes Err68 and Err69 indicate a problem with the output signal on wire 302 Red, 304 Yel wires or the K1 fuel relay.

Test Conditions:

- Park brake locked.
- Transmission in neutral.
- PTO(s) off.
- Operator on seat.
- Key switch in run position.

KN52281,1004418 -19-18DEC12-1/21

Fuel Relay Circuit (Pull-in Coil)—Display Output:

KN52281,1004418 -19-18DEC12-2/21

Step 1

Is either fault code Err68 or Err69 showing on the display panel?

YES: Fault code Err68—Check 302 Red wire for short to ground. Test K1 fuel relay. (See [Relay Test.](#))

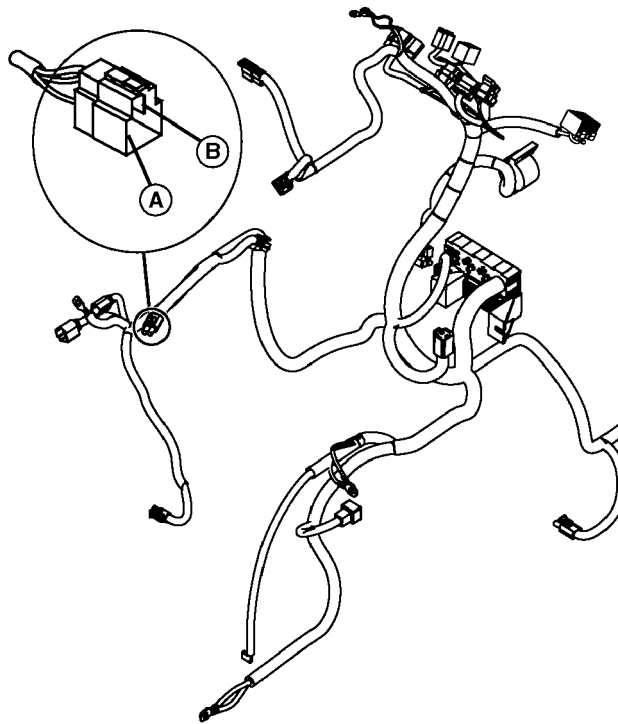
YES: Fault code Err69—Check 302 Red wire for short to battery voltage or open circuit. Test K1 fuel relay. (See [Relay Test.](#))

NO: Go to next step.

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KN52281,1004418 -19-18DEC12-3/21

Step 2



LVAL11617, —UN—02NOV10

A—Fuel Shutoff Solenoid Terminal B, 329 Wht Wire

B—Fuel Shutoff Solenoid Terminal A, 010N Blk Wire

Disconnect fuel shutoff solenoid, X2 connector. Is battery voltage present at terminal B, 329 Wht wire (A)?

YES: Go to next step.

NO: Check continuity on 329 Wht wire from relay terminal 87.

KN52281,1004418 -19-18DEC12-4/21

Step 3

Is continuity to ground present at terminal A, 010N Blk wire (B)?

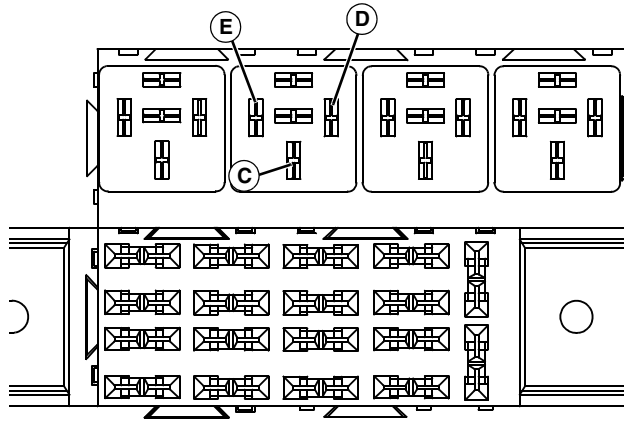
YES: Replace fuel shutoff solenoid.

NO: Connect fuel shutoff solenoid connector. Check 010N and 010P Blk wires and connections.

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KN52281,1004418 -19-18DEC12-5/21

Step 4



LVAL11618—UN—02NOV10

C—K1 Fuel Relay Terminal 30, 002D Red Wire

D—K1 Fuel Relay terminal 86, 304 Yel Wire

E—K1 Fuel Relay terminal 85, 010E Blk Wire

Remove K1 fuel relay. Is battery voltage present at K1 fuel relay terminal 30, 002D Red wire (C)?

YES: Go to next step.

NO: Check F1 fusible link, 002C and 002D Red wires and connections.

KN52281,1004418 -19-18DEC12-6/21

Step 5

Is battery voltage present at K1 fuel relay terminal 86, 304 Yel wire (D)?

YES: Go to next step.

NO: Check that test conditions are met. Check 304 Yel wire and connections.

KN52281,1004418 -19-18DEC12-7/21

Step 6

Is continuity to ground present at K1 fuel relay terminal 85, 010E Blk wire (E)?

YES: Replace fuel relay.

NO: Install fuel relay. Check 010 Blk series wires and connections. If OK, go to next step.

KN52281,1004418 -19-18DEC12-8/21

Test Procedure B

Test Conditions:

- Park brake locked.
- Transmission in neutral.

- PTO(s) off.
- Operator on seat.
- Key switch in run position.
- Y2 fuel shutoff solenoid disconnected.

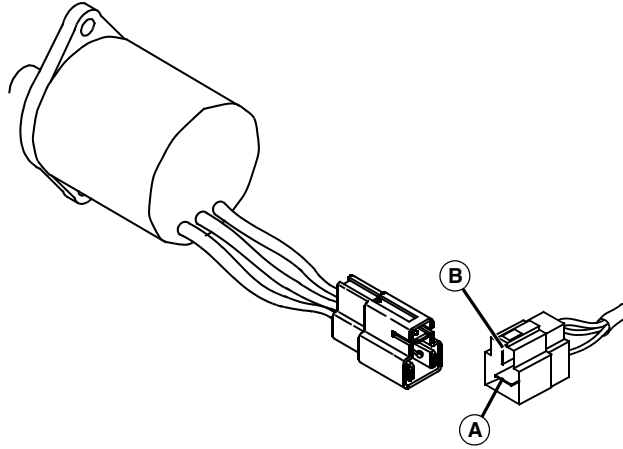
KN52281,1004418 -19-18DEC12-9/21

Fuel Shutoff Circuit (Hold-in Coil)—Display Output

Continued on next page

KN52281,1004418 -19-18DEC12-10/21

Step 1



LVAL11619—UN—02NOV10

A—Y2 Fuel Shutoff Solenoid, 302 Red Wire

B—Y2 Fuel Shutoff Solenoid, 010N and 010P Blk Wires

Is battery voltage present at 302 Red wire (A) of Y2 fuel shutoff solenoid?

YES: Go to next step.

NO: Check 302 Red wire and connections.

KN52281,1004418 -19-18DEC12-11/21

Step 2

Is continuity to ground present at Blk wire of Y2 fuel shutoff solenoid?

YES: Replace Y2 fuel shutoff solenoid.

NO: Check 010N and 010P Blk wire and connections. Connect fuel shutoff solenoid connector.

KN52281,1004418 -19-18DEC12-12/21

Test Procedure C

Test Conditions:

- Park brake locked.

- Transmission in neutral.
- PTO(s) off.
- Operator on seat.
- Key switch in run position.

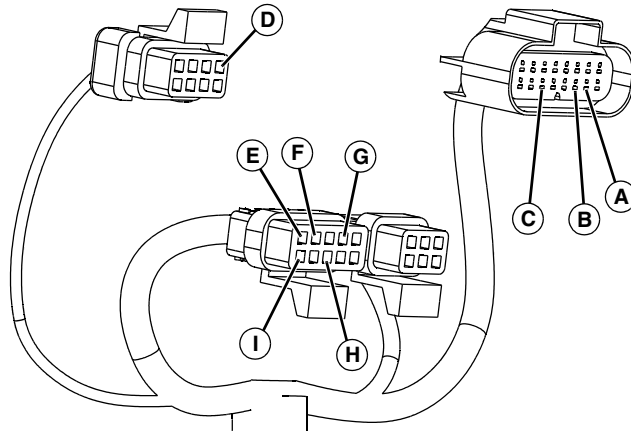
KN52281,1004418 -19-18DEC12-13/21

Fuel Relay Circuit—Display Input:

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KN52281,1004418 -19-18DEC12-14/21

Step 1



LVAL11620—UN—02NOV10

- A—X7 Display Panel Connector Terminal K, 573 Org Wire
- B—X7 Display Panel Connector Terminal L, 539A Wht Wire
- C—X7 Display Panel Connector Terminal P, 050E Blk Wire
- D—X11 Display Panel Connector Terminal H, 050D Blk Wire
- E—X10 Display Panel Connector Terminal A, 562H Red Wire
- F—X10 Display Panel Connector Terminal B, 519 Wht Wire
- G—X10 Display Panel Connector Terminal D, 122E Red Wire
- H—X10 Display Panel Connector Terminal H, 122D Red Wire
- I—X10 Display Panel Connector Terminal K, 586 Blu Wire

Disconnect X7 connector to the display panel. Is battery voltage present at terminal K, 573 Org (A), and terminal L, 539A Wht (B) wires?

YES: Go to next step.

NO: No voltage present at 573 Org wire. Test rear PTO switch. Check 573 Org wire and connections. Test power circuit. (See [Power Circuit Diagnosis](#).)

NO: No voltage present at 539A Wht wire. Test seat switch. Check 539A, 439C, and 539B Wht wires and connections. Test power circuit. (See [Power Circuit Diagnosis](#).)

KN52281,1004418 -19-18DEC12-15/21

Step 2

Is continuity to ground present at X7 connector terminal P, 050E Blk wire (C)?

YES: Connect X7 connector. Go to next step.

NO: Check 050E and 050A Blk wires and connections.

KN52281,1004418 -19-18DEC12-16/21

Step 3

Disconnect X11 connector to the display panel. Is continuity to ground present at terminal H, 050D Blk wire (D)?

YES: Connect X11 connector. Go to next step.

NO: Check 050D and 050A Blk wires and connections.

Continued on next page

KN52281,1004418 -19-18DEC12-17/21

Step 4

Disconnect X10 connector to the display panel. Is battery voltage present at terminal A, 562H Red (E), terminal B, 519 Wht (F), terminal D, 122E Red (G), terminal H, 122D Red (H), and terminal K, 586 Blu (I) wires?

YES: Connect X10 connector. With no output on 302 Red wire at X7 connector terminal B (J), replace the display panel.

NO: No voltage present at 562H Red wire. Test switched power circuit. (See [Power Circuit Diagnosis](#).)

NO: No voltage present at 519 Wht wire. Test transmission neutral switch (PRT). Check 519 Wht wire and connections. Test power circuit. (See [Power Circuit Diagnosis](#).)

NO: No voltage present at 122E or 122D Red wires. Test unswitched power circuit. (See [Power Circuit Diagnosis](#).)

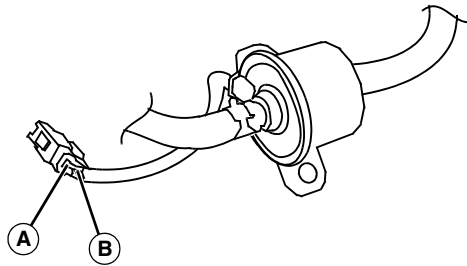
NO: No voltage present at 586 Blu wire. Test park brake switch. Check 586 Blu wire and connections. Test power circuit. (See [Power Circuit Diagnosis](#).)

KN52281,1004418 -19-18DEC12-18/21

Fuel Pump Circuit:

KN52281,1004418 -19-18DEC12-19/21

Step 1



LVAL11621—UN—02NOV10

A—M2 Fuel Pump, 562F Red Wire

B—M2 fuel pump, 010B Blk Wire

Is battery voltage present at 562F Red wire (A) of M2 fuel pump?

YES: Go to next step.

NO: Check 562F, 562N, and 562D Red wires and connections. If OK, test key switch. (See [Key Switch Test](#).)

NO: Check power circuit. (See [Power Circuit Operation \(NA\)](#).)

Continued on next page

KN52281,1004418 -19-18DEC12-20/21

Step 2

Is there continuity between 010B Blk wire (B) of M2 fuel pump and ground?

YES: Replace fuel pump.
NO: Check 010B and 010PBlk wires and connections.

KN52281,1004418 -19-18DEC12-21/21

Fuel Supply/Engine Shutoff Circuit Diagnosis—MY13

Test Procedure A

Fault codes Err68 and Err69 indicate a problem with the output signal on wire 304A Yel wires or the K1 fuel relay.

Fault codes Err70 and Err71 indicate a problem with the output signal on wire 302 Red.

Test Conditions

- Park brake locked.
- Transmission in neutral.
- PTO(s) off.
- Operator on seat.
- Key switch in RUN position.

KN52281,1004419 -19-21JAN13-1/22

Fuel Relay Circuit (Pull-in Coil)—Display Output

KN52281,1004419 -19-21JAN13-2/22

Step 1

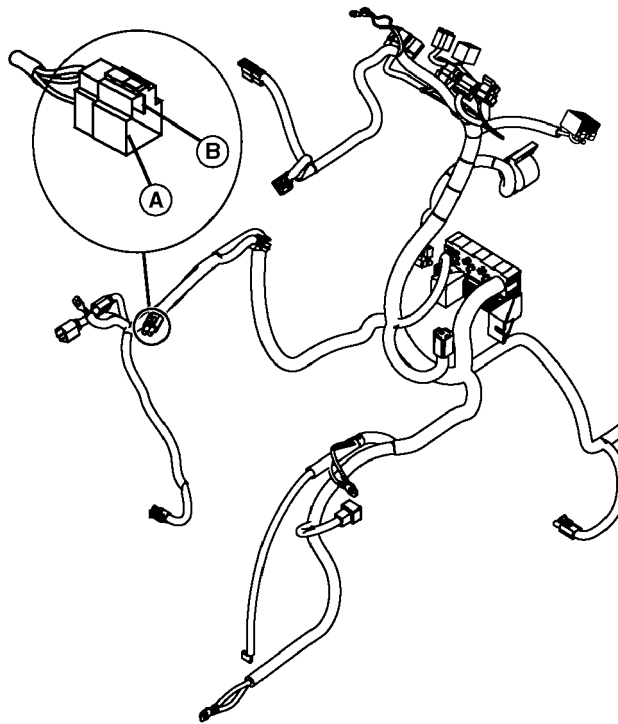
Is either fault code Err68 or Err69 showing on the display panel?

YES: Fault code Err68—Check 304 Yel wire for short to ground. Test K1 fuel relay. (See [Relay Test](#).)
YES: Fault code Err69—Check 304 Yel wire for short to battery voltage or open circuit. Test K1 fuel relay. (See [Relay Test](#).)
NO: Go to next step.

Continued on next page

KN52281,1004419 -19-21JAN13-3/22

Step 2



LVAL11617, —UN—02NOV10

A—Fuel Shutoff Solenoid Terminal B, 329A Wht Wire

B—Fuel Shutoff Solenoid Terminal C, 010N Blk Wire

Disconnect fuel shutoff solenoid, X2 connector. Is battery voltage present at terminal B, 329A Wht wire (A)?

YES: Go to next step.

NO: Check continuity on 329A Wht wire from relay terminal 87.

KN52281,1004419 -19-21JAN13-4/22

Step 3

Is continuity to ground present at terminal C, 010N Blk wire (B)?

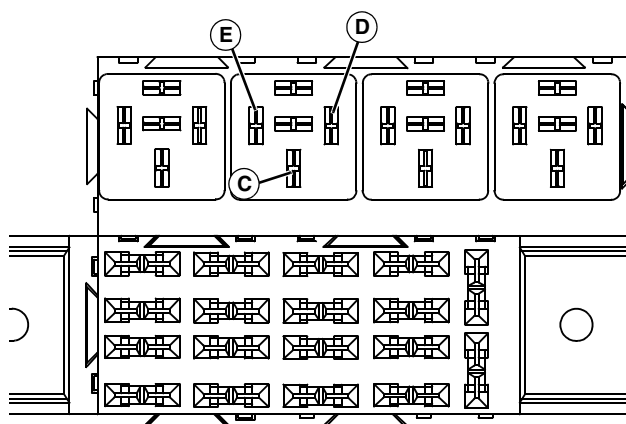
YES: Replace fuel shutoff solenoid.

NO: Connect fuel shutoff solenoid connector. Check 010N and 010P Blk wires and connections.

Continued on next page

KN52281,1004419 -19-21JAN13-5/22

Step 4



LVAL11618—UN—02NOV10

C—K1 Fuel Relay Terminal 30, 002D Red Wire

D—K1 Fuel Relay terminal 86, 304A Yel Wire

E—K1 Fuel Relay terminal 85, 010E Blk Wire

Remove K1 fuel relay. Is battery voltage present at K1 fuel relay terminal 30, 002D Red wire (C)?

YES: Go to next step.

NO: Check F2 fusible link, 002C and 002D Red wires and connections.

KN52281,1004419 -19-21JAN13-6/22

Step 5

Is battery voltage present at K1 fuel relay terminal 86, 304A Yel wire (D)?

YES: Go to next step.

NO: Check that test conditions are met. Check 304A Yel wire and connections.

KN52281,1004419 -19-21JAN13-7/22

Step 6

Is continuity to ground present at K1 fuel relay terminal 85, 010E Blk wire (E)?

YES: Replace fuel relay.

NO: Install fuel relay. Check 010 Blk series wires and connections. If OK, go to next step.

KN52281,1004419 -19-21JAN13-8/22

Test Procedure B

Test Conditions

- Park brake locked.
- Transmission in neutral.

- PTO(s) off.
- Operator on seat.
- Key switch in RUN position.
- Y2 fuel shutoff solenoid disconnected.

KN52281,1004419 -19-21JAN13-9/22

Fuel Shutoff Circuit (Hold-in Coil)—Display Output

Continued on next page

KN52281,1004419 -19-21JAN13-10/22

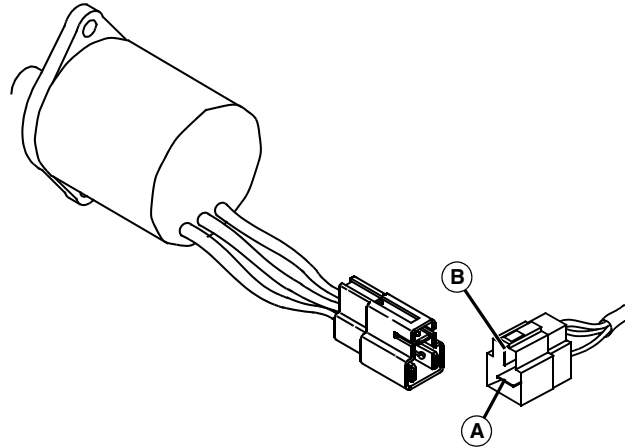
Step 1

Is either fault code Err70 or Err71 showing on the display panel?

YES: Fault code Err70—Check 302 Red wire for short to ground.
YES: Fault code Err71—Check 302 Red wire for short to battery voltage or open circuit.
NO: Go to next step.

KN52281,1004419 -19-21JAN13-11/22

Step 1



LVAL11619—UN—02NOV10

A—Y2 Fuel Shutoff Solenoid, 302 Red Wire

B—Y2 Fuel Shutoff Solenoid, 010N and 010P Blk Wires

Is battery voltage present at 302 Red wire (A) of Y2 fuel shutoff solenoid?

YES: Go to next step.

NO: Check 302 Red wire and connections.

KN52281,1004419 -19-21JAN13-12/22

Step 2

Is continuity to ground present at Blk wire of Y2 fuel shutoff solenoid?

YES: Replace Y2 fuel shutoff solenoid.
NO: Check 010N and 010P Blk wire and connections. Connect fuel shutoff solenoid connector.

KN52281,1004419 -19-21JAN13-13/22

Test Procedure C

Test Conditions

- Park brake locked.

- Transmission in neutral.
- PTO(s) off.
- Operator on seat.
- Key switch in RUN position.

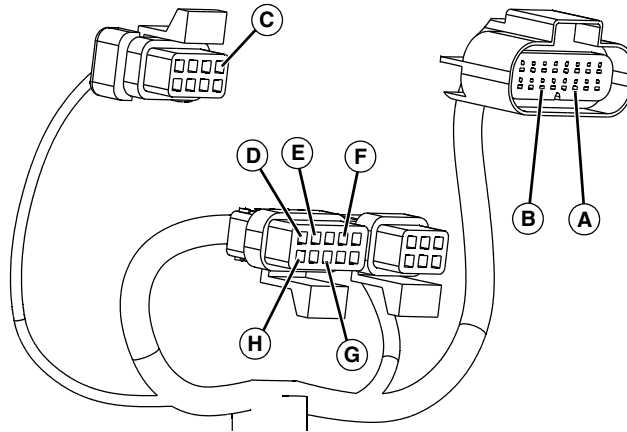
KN52281,1004419 -19-21JAN13-14/22

Fuel Relay Circuit—Display Input

Continued on next page

KN52281,1004419 -19-21JAN13-15/22

Step 1



LVAL38965—UN—27NOV12

A—X7 Display Panel Connector Terminal L, 539A Wht Wire
B—X7 Display Panel Connector Terminal P, 050E Blk Wire
C—X11 Display Panel Connector Terminal H, 050D Blk Wire
D—X10 Display Panel Connector Terminal A, 562H Red Wire
E—X10 Display Panel Connector Terminal B, 519 Wht Wire
F—X10 Display Panel Connector Terminal D, 122E Red Wire
G—X10 Display Panel Connector Terminal H, 122D Red Wire
H—X10 Display Panel Connector Terminal K, 586A Blu Wire
 Is battery voltage present at terminal L, 539A Wht wire (A)?

YES: Go to next step.

NO: No voltage present at 539A Wht wire. Test seat switch. Check 539A, 539C, and 539B Wht wires and connections. (See [Power Circuit Diagnosis—MY13—NA.](#))

KN52281,1004419 -19-21JAN13-16/22

Step 2

Is continuity to ground present at X7 connector terminal P, 050E Blk wire (B)?

YES: Connect X7 connector. Go to next step.
NO: Check 050E and 050A Blk wires and connections.

KN52281,1004419 -19-21JAN13-17/22

Step 3

Disconnect X11 connector to the display panel. Is continuity to ground present at terminal H, 050D Blk wire (C)?

YES: Connect X11 connector. Go to next step.
NO: Check 050D and 050A Blk wires and connections.

Continued on next page

KN52281,1004419 -19-21JAN13-18/22

Step 4

Disconnect X10 connector to the display panel. Is battery voltage present at terminal A, 562H Red (D), terminal B, 519 Wht (E), terminal D, 122E Red (F), terminal H, 122D Red (G), and terminal K, 586A Blu (H) wires?

YES: Connect X10 connector.

NO: No voltage present at 562H Red wire. Test switched power circuit. (See [Power Circuit Diagnosis—MY13—NA.](#))

NO: No voltage present at 519 Wht wire. Test transmission neutral switch (PRT). Check 519 Wht wire and connections. Test power circuit. (See [Power Circuit Diagnosis—MY13—NA.](#))

NO: No voltage present at 122E or 122D Red wires. Test unswitched power circuit. (See [Power Circuit Diagnosis—MY13—NA.](#))

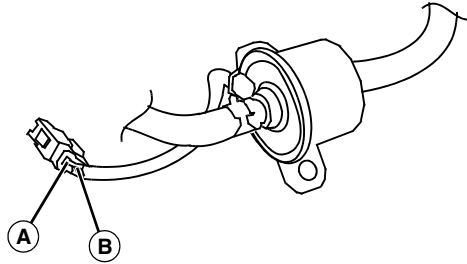
NO: No voltage present at 586 Blu wire. Test park brake switch. Check 586A Blu wire and connections. Test power circuit. (See [Power Circuit Diagnosis—MY13—NA.](#))

KN52281,1004419 -19-21JAN13-19/22

Fuel Pump Circuit

KN52281,1004419 -19-21JAN13-20/22

Step 1



LVAL11621—UN—02NOV10

A—M2 Fuel Pump, 562F Red Wire

B—M2 fuel pump, 010B Blk Wire

Is battery voltage present at 562F Red wire (A) of M2 fuel pump?

YES: Go to next step.

NO: Check 562F, 562N, and 562D Red wires and connections. If OK, test key switch. (See [Key Switch Test.](#))

NO: Check power circuit. (See [Power Circuit Diagnosis—MY13—NA.](#))

Continued on next page

KN52281,1004419 -19-21JAN13-21/22

Step 2

Is there continuity between 010B Blk wire (B) of M2 fuel pump and ground?

YES: Replace fuel pump.
NO: Check 010B and 010PBlk wires and connections.

KN52281,1004419 -19-21JAN13-22/22

Charging Circuit Operation

Function:

To maintain battery voltage between 12.4 and 13.2 volts.

Operating Conditions:

- Key switch in RUN position
- Engine running

Theory of Operation:

The charging system consists of the G2 alternator with an integrated voltage regulator/rectifier. Charging output is controlled by the regulator/rectifier. The status of the charge rate is indicated by the display panel discharge light.

With the key switch in the RUN position, battery sensing circuit current flows through the key switch to the alternator voltage regulator/rectifier via the 072A Red wire. (See [Power Circuit Operation—NA](#) in Section 40, Group 35.) for a description of the complete circuit to the battery positive terminal. The battery sensing circuit allows the voltage regulator/rectifier to monitor battery voltage.

A rotating winding (field) in the alternator induces AC current in the alternator stator coils. The AC current flows to the voltage regulator/rectifier. The voltage regulator/rectifier converts AC current to DC current needed to charge the battery.

If battery voltage is low (sensed via the 072A Red wire), the regulator/rectifier allows DC current to flow to the battery to charge it through the battery charging circuit (002A Red). When the battery is fully charged, the voltage regulator/rectifier stops current flow to the battery.

If the alternator output current falls below system usage or is insufficient to maintain a preset voltage, the voltage regulator/rectifier provides current to turn on the discharge light through the 334 Yel wire, X6 connector terminal A, and the display panel circuit board.

The alternator is grounded through the mounting hardware to the engine.

If the voltage regulator is grounded to the alternator cover, the alternator produces unregulated amperage. (See [Alternator Regulated Voltage Test](#) in Section 40, Group 40.)

KN52281,100441A -19-08JAN13-1/1

Tachometer Circuit Operation

Function:

To indicate engine rpm to the operator.

Operating Conditions:

- Key switch in run position
- Engine running.

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Theory of Operation:

Pulsed current flows from the "IG" terminal of the alternator to the display panel (X8 connector, terminal F) through the 325C and 325B Grn wires.

When current is pulsed through the 325C and 325B Grn wires, the tachometer reads this input and displays the engine rpm speed.

Additionally, on eHydro™/Auto HST machines, the 325A Grn wire supplies input pulses to the A2 drive controller to indicate to the controller the engine speed.

KN52281,100441B -19-02NOV12-1/1

Tachometer Circuit Operation—MY13

Function

To indicate engine rpm to the operator.

Operating Conditions

- Key switch in run position
- Engine running.

Theory of Operation

Pulsed current from the "IG" terminal of the alternator flows through the 325C and 325D Grn wires to the A2 electronic drive controller. The A2 drive controller then transmits the engine speed information across the RS232 communication line (924 Yel wire) to the A1 display panel. The engine speed information is displayed on the display panel tachometer in revolutions per minute (rpm).

KN52281,100441C -19-21JAN13-1/1

Hour Meter Circuit Operation

Function:

To indicate engine hours of use to the operator.

Operating Conditions:

- Key switch in RUN position
- Engine running.

Theory of Operation:

The hour meter is integrated into the display panel and does not have any external wiring. The hour meter operates only when the engine is running. The hour meter uses the engine tachometer circuit for power. If the tachometer is not functioning, the hour meter will not work.

KN52281,100441D -19-08JAN13-1/1

Speedometer Circuit Operation—eHydro™ and Auto HST

Function:

To indicate ground speed of the machine.

Operating Conditions:

- Key switch in RUN position, and
- Engine running with machine in motion.

Theory of Operation:

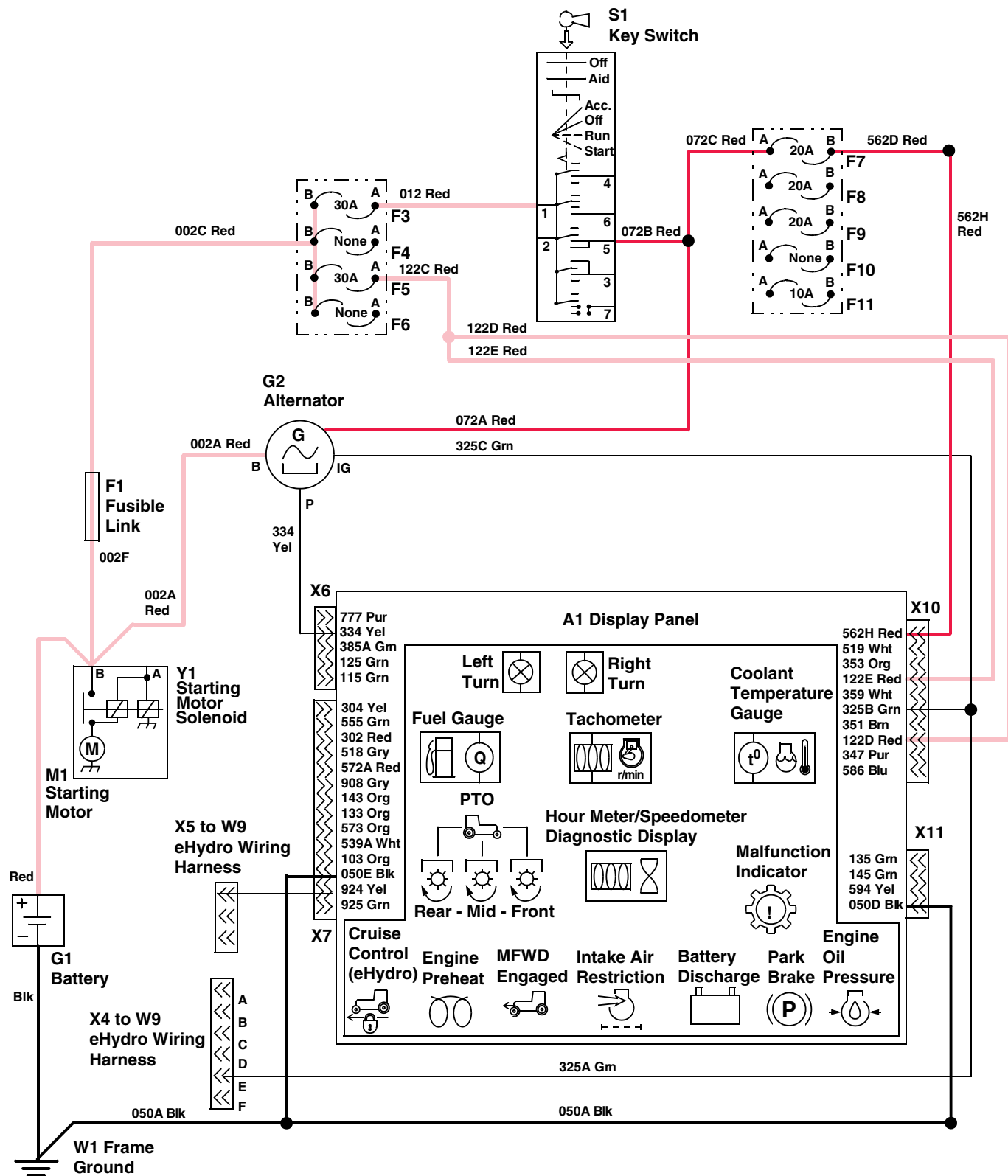
The speedometer is integrated into the display panel and does not have any external wiring. The speedometer

operates only when the engine is running and the machine is in motion. The speedometer uses the T3 MFWD speed sensor for a reference signal to indicate machine ground speed.

The T3 MFWD speed sensor sends a pulsed signal to the A2 electronic drive controller. The A2 electronic drive controller then transmits the travel speed information across the RS232 communication line (924 Yel wire) to the A1 display panel. The travel speed information appears on the hour meter/speedometer digital display as miles per hour (mph) or kilometers per hour (kph), depending on setting.

KN52281,100441E -19-08JAN13-1/1

Charging, Tachometer, Speedometer and Hour Meter Circuit Electrical Schematic—Pre MY08



LVAL11622 —UN—02NOV10

Continued on next page

KN52281,100441F -19-02NOV12-1/2

A1—Display Panel
 F1— Fusible Link
 F3— Fuse 30A
 F4— Not Used
 F5— Fuse 30A
 F6— Not Used
 F7— Fuse 20A
 F8— Fuse 20A
 F9— Fuse 20A
 F10— Not Used
 F11— Fuse 10A

G1—Battery
 G2—Alternator
 M1—Starting Motor
 S1—Key Switch
 W1—Frame Ground
 X4— W1 Main Wiring
 Harness-to-W9 eHydro™
 Wiring Harness

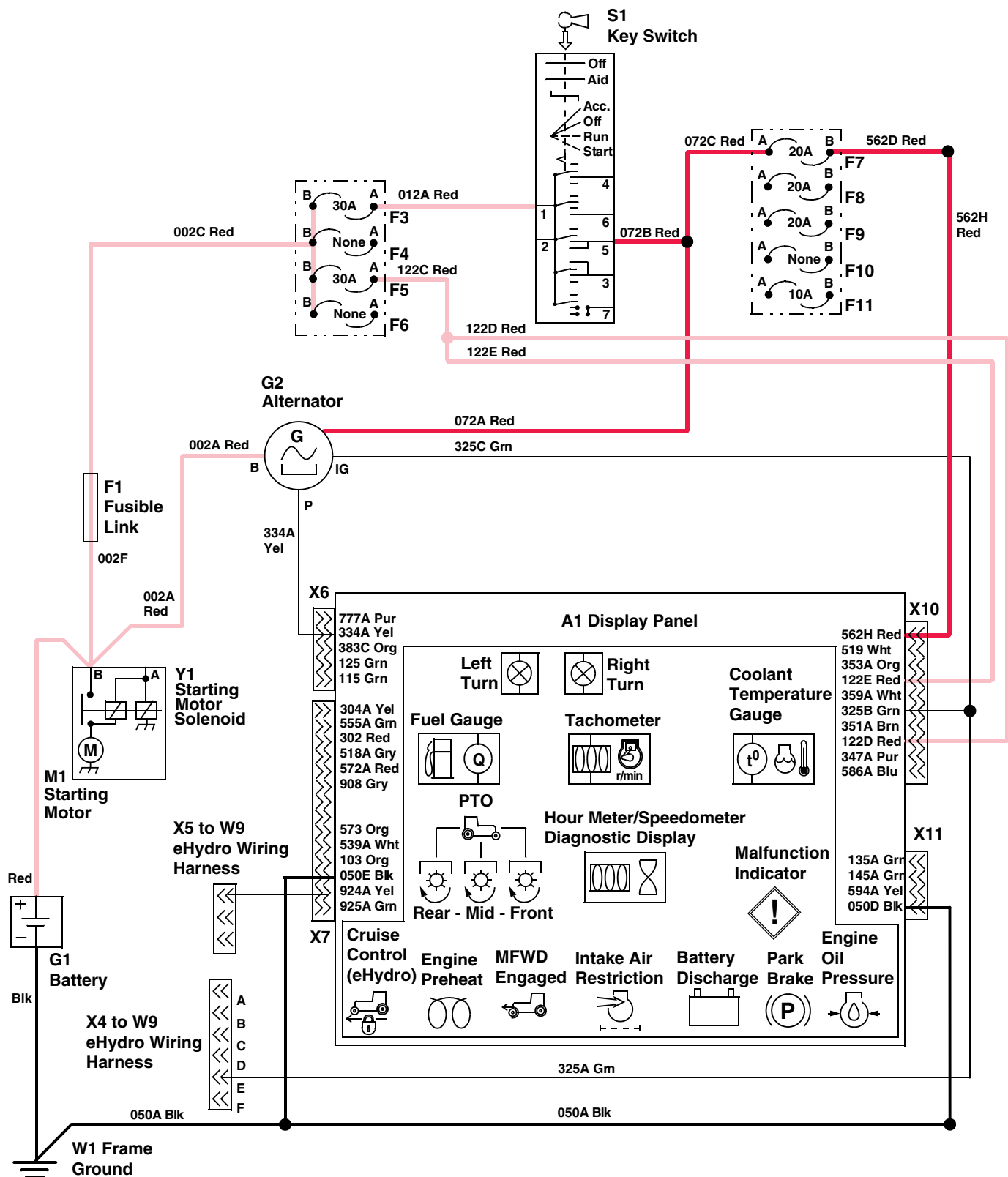
X5— W1 Main Wiring
 Harness-to-W9 eHydro™
 Wiring Harness
 X6— W1 Main Wiring
 Harness-to-A1 Display Panel
 X7— W1 Main Wiring
 Harness-to-A1 Display Panel
 X10— W1 Main Wiring
 Harness-to-A1 Display
 Panel

X11— W1 Main Wiring
 Harness-to-A1 Display
 Panel
 Y1— Starting Motor Solenoid

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KN52281,100441F -19-02NOV12-2/2

Charging, Tachometer, Speedometer and Hour Meter Circuit Electrical Schematic—MY08



LVAL11623 —UN—02NOV10

Continued on next page

KN52281,1004420 -19-02NOV12-1/2

A1—Display Panel
 F1— Fusible Link
 F3— Fuse 30A
 F4— Not Used
 F5— Fuse 30A
 F6— Not Used
 F7— Fuse 20A
 F8— Fuse 20A
 F9— Fuse 20A
 F10— Not Used
 F11— Fuse 10A

G1—Battery
 G2—Alternator
 M1—Starting Motor
 S1—Key Switch
 W1—Frame Ground
 X4— W1 Main Wiring
 Harness-to-W9 eHydro™
 Wiring Harness

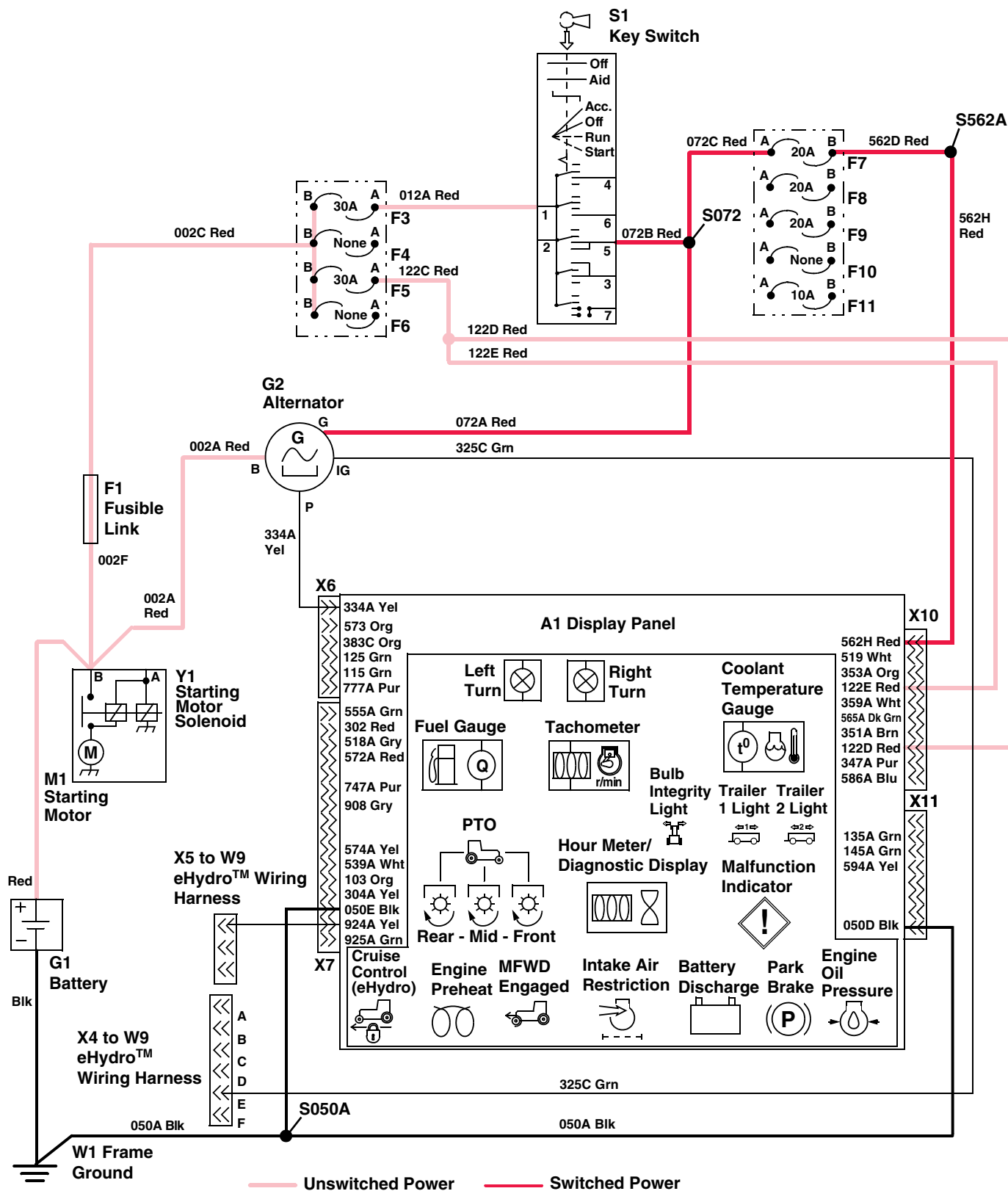
X5— W1 Main Wiring
 Harness-to-W9 eHydro™
 Wiring Harness
 X6— W1 Main Wiring
 Harness-to-A1 Display Panel
 X7— W1 Main Wiring
 Harness-to-A1 Display Panel
 X10— W1 Main Wiring
 Harness-to-A1 Display
 Panel

X11— W1 Main Wiring
 Harness-to-A1 Display
 Panel
 Y1— Starting Motor Solenoid

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KN52281,1004420 -19-02NOV12-2/2

Charging, Tachometer, Speedometer and Hour Meter Circuit Electrical Schematic—MY13



LVAL38727 —UN—17JAN13

Continued on next page

KN52281,1004421 -19-08JAN13-1/2

A1—Display Panel
F1— Fusible Link
F3— Fuse 30A
F4— Not Used
F5— Fuse 30A
F6— Not Used
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A
F10— Not Used
F11— Fuse 10A

G1—Battery
G2—Alternator
M1—Starting Motor
S1—Key Switch
W1—Frame Ground
X4—W1 Main Wiring Harness-
to-W9 eHydro™/Auto HST
Wiring Harness

X5—W1 Main Wiring Harness-
to-W9 eHydro™/Auto HST
Wiring Harness
X6—W1 Main Wiring
Harness-to-A1 Display Panel
X7—W1 Main Wiring
Harness-to-A1 Display Panel

X10— W1 Main Wiring
Harness-to-A1 Display
Panel
X11— W1 Main Wiring
Harness-to-A1 Display
Panel
Y1—Starting Motor Solenoid

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KN52281,1004421 -19-08JAN13-2/2

Charging, Tachometer and Hour Meter Circuit Diagnosis

Test Procedure A

Test Conditions:

- Key switch in run position, engine running at low idle.

- Park brake locked.
- Transmission in neutral.
- PTO(s) off.
- Fully charged battery.
- All accessories off.

KN52281,1004422 -19-18DEC12-1/8

Charging System

KN52281,1004422 -19-18DEC12-2/8

Step 1

Is battery discharge indicator light illuminated?

YES: Test battery. (See [Battery—Load Test](#).) Place battery on charge. (See [Battery—Charge](#).) Go to next step.
NO: Go to next step.

KN52281,1004422 -19-18DEC12-3/8

Step 2

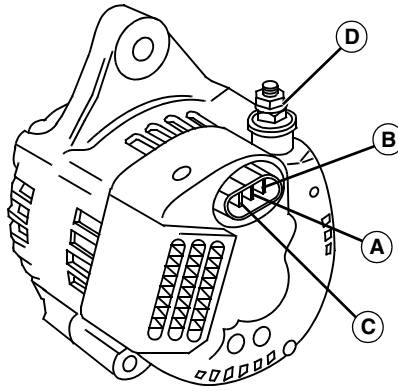
Does the tachometer display engine rpm?

YES: Go to next step.
NO: Check 325C and 325B Grn wires and connections. If OK, remove and test alternator. (See [Alternator Removal and Installation](#).)

Continued on next page

KN52281,1004422 -19-18DEC12-4/8

Step 3



LVAL11624 —UN—02NOV10

A—Alternator Terminal, 072A Red wire

B—Alternator Terminal IG , 334 Yel Wire

C—Alternator terminal P, 325C Grn wire

D—Alternator Terminal B1, 002A Red Wire

Measure voltage at B1 terminal, 002A Red wire, of alternator (D). Is reading 14.0 volts or greater?

YES: Go to next step.

NO: Test battery. (See [Battery—Load Test.](#)) Place battery on charge. (See [Battery—Charge.](#)) Check circuit back to battery and ground connections. If OK, remove and test alternator. (See [Alternator Removal and Installation.](#))

KN52281,1004422 -19-18DEC12-5/8

Step 4

Measure voltage at IG terminal, 334 Yel wire, of alternator (B). Is reading 14.0 volts or greater?

YES: Go to next step.

NO: Remove and test alternator. (See [Alternator Removal and Installation.](#))

KN52281,1004422 -19-18DEC12-6/8

Step 5

Measure voltage at P terminal, 325C Grn wire, of alternator (C). Is reading 7.25 volts or greater?

YES: Go to next step.

NO: Remove and test alternator. (See [Alternator Removal and Installation.](#))

KN52281,1004422 -19-18DEC12-7/8

Step 6

Measure voltage at 072A Red wire (A) of alternator. Is reading 14.0 volts or higher?

YES: Test complete.

NO: Check 072A and 072B Red wires and connections. Test key switch. Check switched power circuit. (See [Power Circuit Operation \(NA\).](#))

KN52281,1004422 -19-18DEC12-8/8

Charging, Tachometer and Hour Meter Circuit Diagnosis—MY13

Test Procedure A

Test Conditions

- Key switch in RUN position, engine running at low idle.

- Park brake locked.
- Transmission in neutral.
- PTO(s) off.
- Fully charged battery.
- All accessories off.

KN52281,1004423 -19-21JAN13-1/8

Charging System

KN52281,1004423 -19-21JAN13-2/8

Step 1

Is battery discharge indicator light on?

YES: Test battery. (See [Battery—Load Test](#).) Place battery on charge. (See [Battery—Charge](#).) Go to next step.

NO: Go to next step.

KN52281,1004423 -19-21JAN13-3/8

Step 2

Does the tachometer display engine rpm?

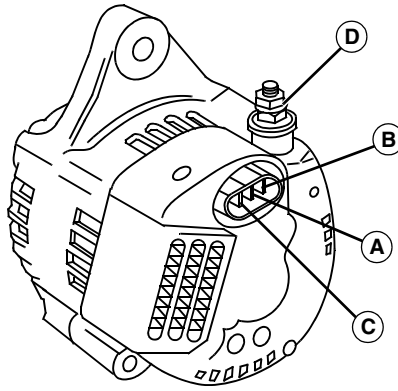
YES: Go to next step.

NO: Check 325 Grn series wires and connections. If OK, remove and test alternator. (See [Alternator Removal and Installation](#))

Continued on next page

KN52281,1004423 -19-21JAN13-4/8

Step 3



LVAL11624 —UN—02NOV10

A—Terminal G (072A Red wire)

B—Terminal P (334A Yel wire)

C—Terminal IG (325C Grn wire)

D—Terminal B1 (002A Red wire)

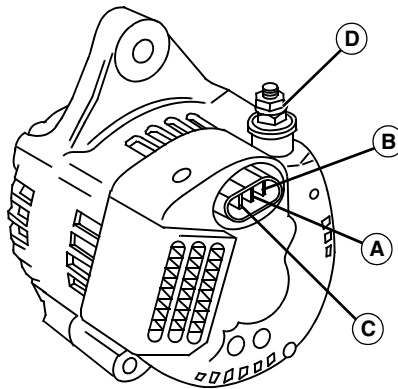
Measure voltage at terminal B1 (002A Red wire) (D) of alternator. Is reading 14.0 volts or greater?

YES: Go to next step.

NO: Test battery. (See [Battery—Load Test](#).) Place battery on charge. (See [Battery—Charge](#).) Check circuit back to battery and ground connections. If OK, remove and test alternator. (See [Alternator Removal and Installation](#).)

KN52281,1004423 -19-21JAN13-5/8

Step 4



LVAL11624 —UN—02NOV10

A—Terminal G (072A Red wire)

B—Terminal P (334A Yel wire)

C—Terminal IG (325C Grn wire)

D—Terminal B1 (002A Red wire)

Measure voltage at terminal P (334A Yel wire) (B) of alternator. Is reading 14.0 volts or greater?

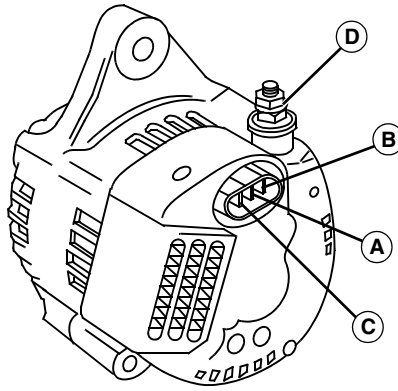
YES: Go to next step.

NO: Remove and test alternator. (See [Alternator Removal and Installation](#).)

Continued on next page

KN52281,1004423 -19-21JAN13-6/8

Step 5



LVAL11624 —UN—02NOV10

A—Terminal G (072A Red wire)

B—Terminal P (334A Yel wire)

C—Terminal IG (325C Grn wire)

D—Terminal B1 (002A Red wire)

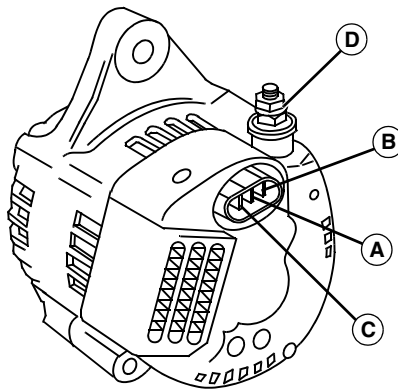
Measure voltage at terminal IG (325C Grn wire) (C) of alternator. Is reading 7.25 volts or greater?

YES: Go to next step.

NO: Remove and test alternator. (See [Alternator Removal and Installation.](#))

KN52281,1004423 -19-21JAN13-7/8

Step 6



LVAL11624 —UN—02NOV10

A—Terminal G (072A Red wire)

B—Terminal P (334A Yel wire)

C—Terminal IG (325C Grn wire)

D—Terminal B1 (002A Red wire)

Measure voltage at terminal G (072A Red wire) (A) of alternator. Is reading 14.0 volts or higher?

YES: Test complete.

NO: Check 072A and 072B Red wires and connections. Test key switch. Check switched power circuit. (See [Power Circuit Operation—NA.](#))

KN52281,1004423 -19-21JAN13-8/8

Rear and Mid PTO Circuit Operation

Function:

To engage the rear PTO and illuminate a light on the display panel to alert the operator that the rear PTO is on.

Operating Conditions:

- Key switch in run or start position
- Operator on seat, or off seat if the off seat PTO logic is activated. (See Fuel Supply/Engine Shutoff Circuit Operation in Section 40, Group 35.)
- Rear PTO switch on

Rear PTO Theory of Operation:

The rear PTO switch is used as an interlock to the fuel supply circuit as well as engaging the rear PTO.

In the off (normally closed) position the rear PTO switch supplies current to the fuel supply circuit through the A1 display panel. If the rear PTO is on and the operator leaves the seat, current is removed from the fuel supply circuit unless the off seat PTO logic is activated.

With the key in start or run position, battery voltage is provided to the S3 rear PTO switch through the S1 key switch, 072B and 072C Red wires, F7 fuse, and 562D and 562A Red wires.

With the PTO on, the rear PTO switch is in the on (open) position, and voltage is supplied across the rear PTO switch (terminals 1 and 4) from the 562A Red wire to the 574 Yel wire. The 574 Yel wire supplies current to the Y3 rear PTO solenoid to energize the solenoid and engage the rear PTO.

The ground circuit for the rear PTO solenoid is provided through the 010M and 010P Blk wires.

At the same time power is removed from the 573 Org wire which supplies current to the A1 display panel through the X7 connector (terminal K). The display panel logic reads the power being removed from this input and turns on the rear PTO indicator light. Additionally, the display panel checks for the proper inputs from the other switches. If the seat switch is closed (operator on seat) then the display panel continues to provide an output to the fuel hold-in solenoid. If the operator is off the seat, then the off seat PTO logic must be active before the rear PTO switch is placed in the on position or the display panel removes power to the fuel hold-in solenoid.

A ground circuit path for the display panel is provided through the X7 connector (terminal P) 050E Blk wire and X11 connector (terminal H) 050D Blk wire, both spliced into the 050A Blk wire to frame ground.

Mid PTO Function:

To engage the mid PTO and illuminate a light on the display panel to alert the operator that the mid PTO is on.

Operating Conditions:

- Key switch in run or start position
- Operator on seat, and
- Mid PTO switch on.

Mid PTO Theory of Operation:

The mid PTO switch is used as an interlock to the fuel supply circuit as well as engaging the mid PTO.

In the off (normally closed) position the mid PTO switch supplies current to the fuel supply circuit through the A1 display panel. If the mid PTO is on and the operator leaves the seat, current is removed from the fuel supply circuit.

With the key in the start or run position, battery voltage is provided to the S9 mid PTO switch through the S1 key switch, 072B and 072C Red wires, F7 fuse, and 562D, 562N and 562L Red wires.

With the PTO on, the mid PTO switch is in the on (open) position, and voltage is removed from the 594 Yel wire at the A1 display panel. This indicates to the display panel that the mid PTO is engaged. The mid PTO indicator on the dash panel illuminates.

The display panel checks for the proper inputs from the other switches. If the seat switch is closed (operator on seat) then the display panel continues to provide an output to the fuel hold-in solenoid. If the operator is off the seat, the display panel removes power to the fuel hold-in solenoid, shutting off the engine.

A ground circuit path for the display panel is provided through the X7 connector (terminal P) 050E Blk wire and X11 connector (terminal H) 050D Blk wire, both spliced into the 050A Blk wire to frame ground.

The rear PTO can be used simultaneously with the mid PTO, but only with the operator on the seat. The S11 rear PTO switch is closed when both of the PTOs are selected. The 777 Pur wire, power supplied through the closed S11 switch by the 562M Red wire, sends the display panel (X7 connector, terminal F) battery voltage along with the lack of signal at the 594 Yel wire to indicate that both the mid and rear PTOs are engaged. This illuminates the PTO indicator lights. These lights flashes or remain on constantly depending PTO selection combinations.

PTO Indicator Light Display Combinations:

Input/PTO Switch Position	Rear PTO Indicator Light Condition	Mid PTO Indicator Light Condition
(B+) Rear PTO ON—(B+) Mid PTO OFF	Solid ON	OFF
(Gnd) Rear PTO OFF—(Gnd) Mid PTO ON	OFF	Solid ON
(B+) Rear PTO ON—(Gnd) Mid PTO ON	FLASHING	FLASHING
(Gnd) Rear PTO OFF—(B+) Mid PTO OFF	OFF	OFF

KN52281,1004424 -19-02NOV12-2/2

Rear and Mid PTO Circuit Operation—MY13

Rear PTO Function

To engage the rear PTO and illuminate the rear PTO light on the display panel to alert the operator that the rear PTO is activated.

Operating Conditions

- Key switch in RUN or START position.
- Operator on seat, or off-seat PTO logic activated.
- PTO selector lever at TOP position.
- Rear PTO switch in ON position.

Rear PTO Theory of Operation

The rear PTO circuit is controlled by the A1 display panel based upon "IF" "THEN" logic. If the operating conditions are met, then the display panel will supply an output signal to the Y3 rear PTO solenoid.

Unswitched power is supplied to the A1 display panel at terminals D and H (122E and 122D Red wires) on the X10 connector. When the key switch is in the RUN or START position, switched power is supplied to the A1 display panel at terminal A (562H Red wire) on the X10 connector, powering up the display panel. For more information, see [Power Circuit Operation—NA](#) in Section 40, Group 40.

A ground circuit path for the display panel is provided to terminal P (050E Blk wire) on the X7 connector and to terminal H (050D Blk wire) on the X11 connector. Both 050D and 050E Blk wires are spliced to the 050A Blk wire, which is connected to W1 frame ground.

The S3 rear PTO switch is used as an interlock in the fuel supply circuit and in the cranking circuit, as well as engaging the rear PTO. The display panel contains control logic that determines the switch status by the input it receives from the rear PTO switch.

For operation of the fuel supply circuit and how the PTO circuit interacts, see [Fuel Supply/Engine Shutoff Circuit Operation—MY13](#) in Section 40, Group 40.

For operation of the cranking circuit and how the PTO circuit interacts, see [Cranking Circuit Operation—MY13](#) in Section 40, Group 40.

For PTO operation with operator on seat, the display panel will supply an output to the 747A Pur wire to energize the Y3 rear PTO solenoid when it detects the following inputs:

- Battery voltage at terminal L (539A Wht wire) on X7 connector from S6 seat switch (ON position).
- Battery voltage at terminal F (777A Pur wire) on X6 connector from S11 rear PTO sensing switch (ON position).
- Battery voltage at terminal D (594A Yel wire) on X11 connector from W3 mid PTO jumper or S9 mid PTO sensing switch (OFF position) (if equipped).
- Input signal at terminal Q (924A Yel wire) on X7 connector from A2 electronic drive controller indicating engine is running.

- Battery voltage at terminal K (574A Yel wire) on X7 connector from S3 rear PTO switch (ON position).

When the key switch is in the START or RUN position, battery voltage is provided to terminals 1 and 3 of the S3 rear PTO switch through the S1 key switch, 072B and 072C Red wires, F7 fuse, and 562D, 562A, and 562AH Red wires.

When the S3 rear PTO switch is in the ON position, the contacts between terminals 1 and 4 are closed, allowing current to flow from the 562A Red wire, through the 574A Yel wire, to terminal K on the X7 connector of the display panel. If the operator is on the seat or if the off-seat PTO logic is activated, the display panel provides current to the fuel supply circuit. For off-seat PTO logic operation, see [Fuel Supply/Engine Shutoff Circuit Operation—MY13](#) in Section 40, Group 40.

When the logic inside the display panel determines that all requirements for rear PTO operation are met, the display panel sends current through the 747A Pur wire to the Y3 rear PTO solenoid, energizing the solenoid.

The ground circuit for the rear PTO solenoid is provided though the 010M and 010P Blk wires.

The energized rear PTO solenoid engages the rear PTO. For hydraulic operation of the PTO, see [PTO Clutch and Brake Theory of Operation](#) in Section 80, Group 45.

For the rear PTO to operate, the PTO selector lever must be at the TOP position (rear PTO operation only) or the CENTER position (rear and mid PTO operation).

For mechanical operation of the PTO, see [Power Transmission—Mid PTO](#) in Section 80, Group 45)

With the PTO selector lever at either the TOP or CENTER positions, the S11 rear PTO sensing switch is closed, allowing current to flow from the F7 fuse, through the 562D and 562AM Red wires, the S11 rear PTO sensing switch, and the 777A Pur wire, to terminal F on the X6 connector of the A1 display panel. When current is detected at terminal F on the X6 connector and all other required inputs are met, the logic in the display panel will illuminate the rear PTO indicator light on the display panel.

NOTE: If PTO lever is at the CENTER position (rear and mid PTO operation), operator must be on the seat for the PTO to operate.

Mid PTO Function (If Equipped)

To engage the mid PTO and illuminate a light on the display panel to alert the operator that the mid PTO is activated.

Operating Conditions:

- Key switch in RUN or START position
- Operator on seat, and
- PTO selector lever at BOTTOM position.
- Rear PTO switch is in ON position.

Mid PTO Theory of Operation

The S3 rear PTO switch and S9 mid PTO sensing switch are used as interlocks to the fuel supply circuit.

When in the OFF (normally closed) position, the S9 mid PTO sensing switch supplies current to the A1 display panel. If the mid PTO is activated and the operator leaves the seat, the logic in the display panel will remove current from the fuel supply circuit, stopping the engine. For more information, see Fuel Supply/Engine Shutoff Circuit Operation—MY13 in Section 40, Group 40.

When the key switch is in the RUN or START position, battery voltage is provided to the S9 mid PTO sensing switch through the S1 key switch, 072B and 072C Red wires, F7 fuse, and 562D, 562N and 562L Red wires. When the PTO selector lever is at the TOP position (rear PTO operation only), S9 mid PTO sensing switch is closed, allowing current to flow through the 594 Yel wire to terminal D on the X11 connector of the A1 display panel. When an input is detected at terminal D on the X11 connector, the logic in the display panel determines that only the rear PTO is being requested.

For the mid PTO to operate, the following conditions must be met:

- S3 rear PTO switch in the ON position.
- S6 seat switch closed (operator on seat).
- PTO selector lever at the BOTTOM position (mid PTO operation only) or the CENTER position (rear and mid PTO operation).

For mechanical operation of the PTO, see Power Transmission—Mid PTO in Section 80, Group 45)

With the PTO selector lever at either the BOTTOM or CENTER position, the normally closed S9 mid PTO sensing switch is open, preventing current from flowing to terminal D on the X11 connector of the A1 display panel. When the display panel does not detect an input at terminal D on the X11 connector, the logic in the display panel determines that the mid PTO is being requested. When all other required inputs are met, the display panel illuminates the mid PTO indicator light.

The display panel checks for the proper inputs from the other switches. If the seat switch is closed (operator on seat) and machine is not in reverse, then the display panel will continue to provide an output to the hold-in coil of the fuel shutoff solenoid. If the operator is off the seat or reverse travel direction is selected, the display panel removes power to the hold-in coil of fuel shutoff solenoid, stopping the engine.

NOTE: *If the machine is equipped with the optional RIO function, the mid PTO can be operated with machine in reverse if the RIO function is activated.*

A ground circuit path for the display panel is provided to terminal P (050E Blk wire) on the X7 connector and to terminal H (050D Blk wire) on the X11 connector. Both are spliced to the 050A Blk wire, which connects to W1 frame ground.

Reverse Implement Option (RIO) Theory of Operation

The RIO position of the PTO switch allows the operator to operate a mid mount implement while the tractor is traveling in the reverse direction. This function must be selected before each time the tractor is placed in reverse. When in reverse, the RIO function will stay enabled until machine is returned to neutral.

When the PTO switch is momentarily pulled to the RIO position, current from the 562A and 562AH red wires is supplied across the S3 rear PTO switch (terminals 3 and 6), through the 573 Org wire, to terminal B on the X6 connector of the A1 display panel.

When logic inside the display panel determines that all required inputs are met, the display panel will allow the mid PTO to operate while tractor is traveling in reverse direction.

NOTE: *If a front implement is installed, a voltage signal is sent to terminal F on the X10 connector of the A1 display panel, via the X57 connector. When the display panel detects this signal, the machine is allowed to travel in reverse direction during front PTO operation without need of activating the RIO function.*

Rear and Mid PTO Theory of Operation

The rear PTO can be engaged simultaneously with the mid PTO, but only when the operator is on the seat.

When both PTOs are selected (PTO selector lever at the CENTER position), the display panel will energize the Y3 rear PTO solenoid and illuminate both the rear and mid PTO indicator lights when the display panel detects the following inputs:

- Battery voltage at terminal L on X7 connector (539A Wht wire) (S6 seat switch closed).
- Battery voltage at terminal K on X7 connector (574A Yel wire) (S3 rear PTO switch in ON position).
- Battery voltage at terminal F on X6 connector (777A Pur wire) (S11 rear PTO sensing switch is closed).
- No signal at terminal D on X11 connector (594 Yel wire) (S9 mid PTO sensing switch is open).

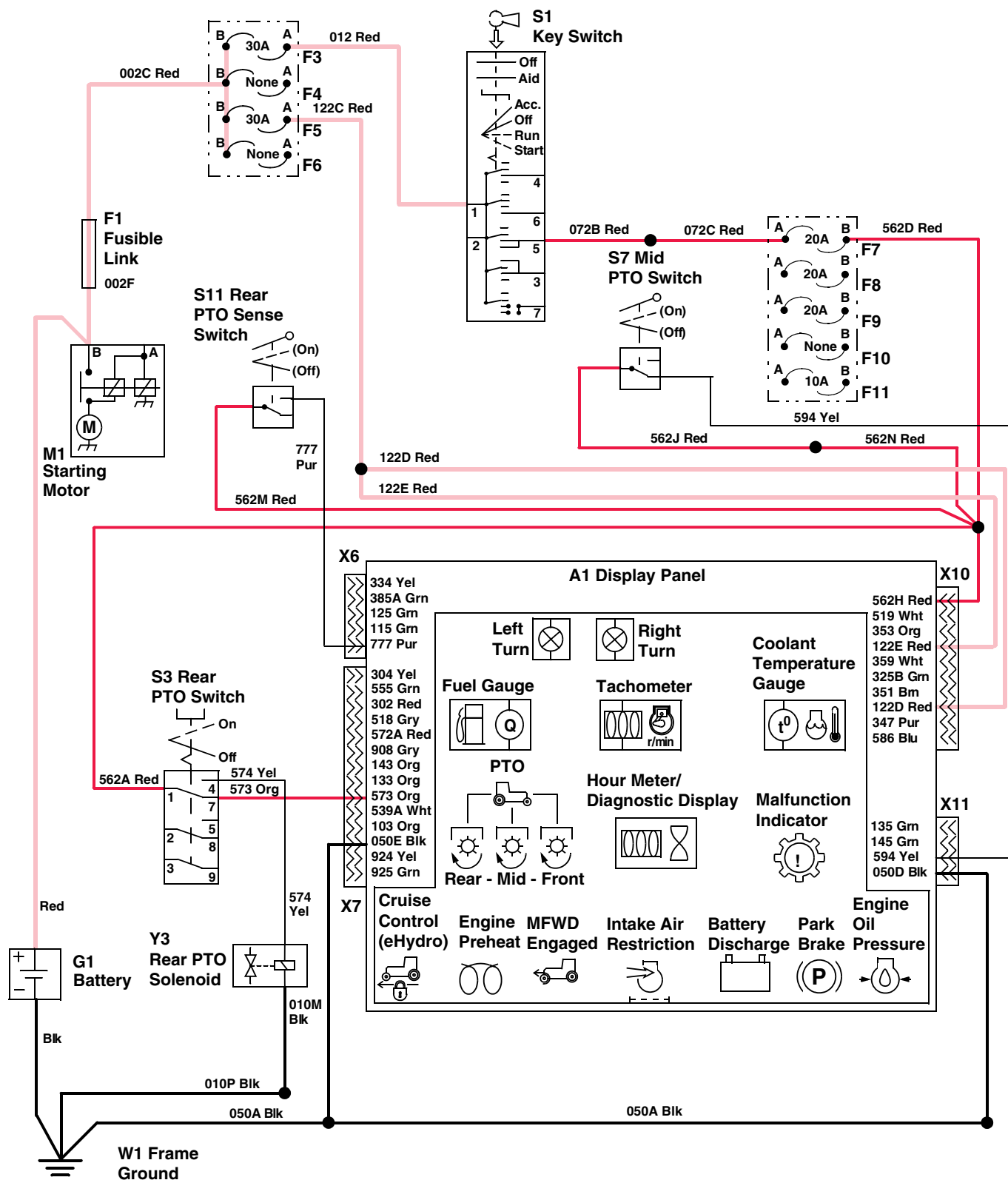
The PTO indicator lights will flash or remain on constantly depending PTO selection combinations as shown in following table.

PTO Indicator Light Display Combinations

S3 Rear PTO Switch Position	PTO Selector Lever Position (Operator Intent)	S3, S9, and S11 Switch Status	B+ Input	Rear PTO Indicator Light Status	Mid PTO Indicator Light Status
ON	Top (Rear PTO ON)	S3 closed (terminals 1—4) S11 closed S9 closed	Yes Yes Yes	Solid ON	OFF
ON	Bottom (Mid PTO ON)	S3 closed (terminals 1—4) S11 open S9 open	Yes No No	OFF	Solid ON
ON	Center (Rear and Mid PTO ON)	S3 closed (terminals 1—4) S11 closed S9 open	Yes Yes No	Solid ON	Solid ON
RIO	Center (RIO PTO ON)	S3 closed (terminals 1—4 and 3—6) S11 closed S9 open	Yes Yes No	FLASHING	FLASHING
RIO	Bottom (RIO PTO ON)	S3 closed (terminals 1—4 and 3—6) S11 open S9 open	Yes No No	OFF	FLASHING
OFF	Any lever position (All PTOs OFF)	S3 open (terminals 1—4 and 3—6) S11 — S9 —	No — —	OFF	OFF

KN52281,1004425 -19-21JAN13-3/3

Rear and Mid PTO Circuit Electrical Schematic—Pre MY08



LVAL11625—UN—02NOV10

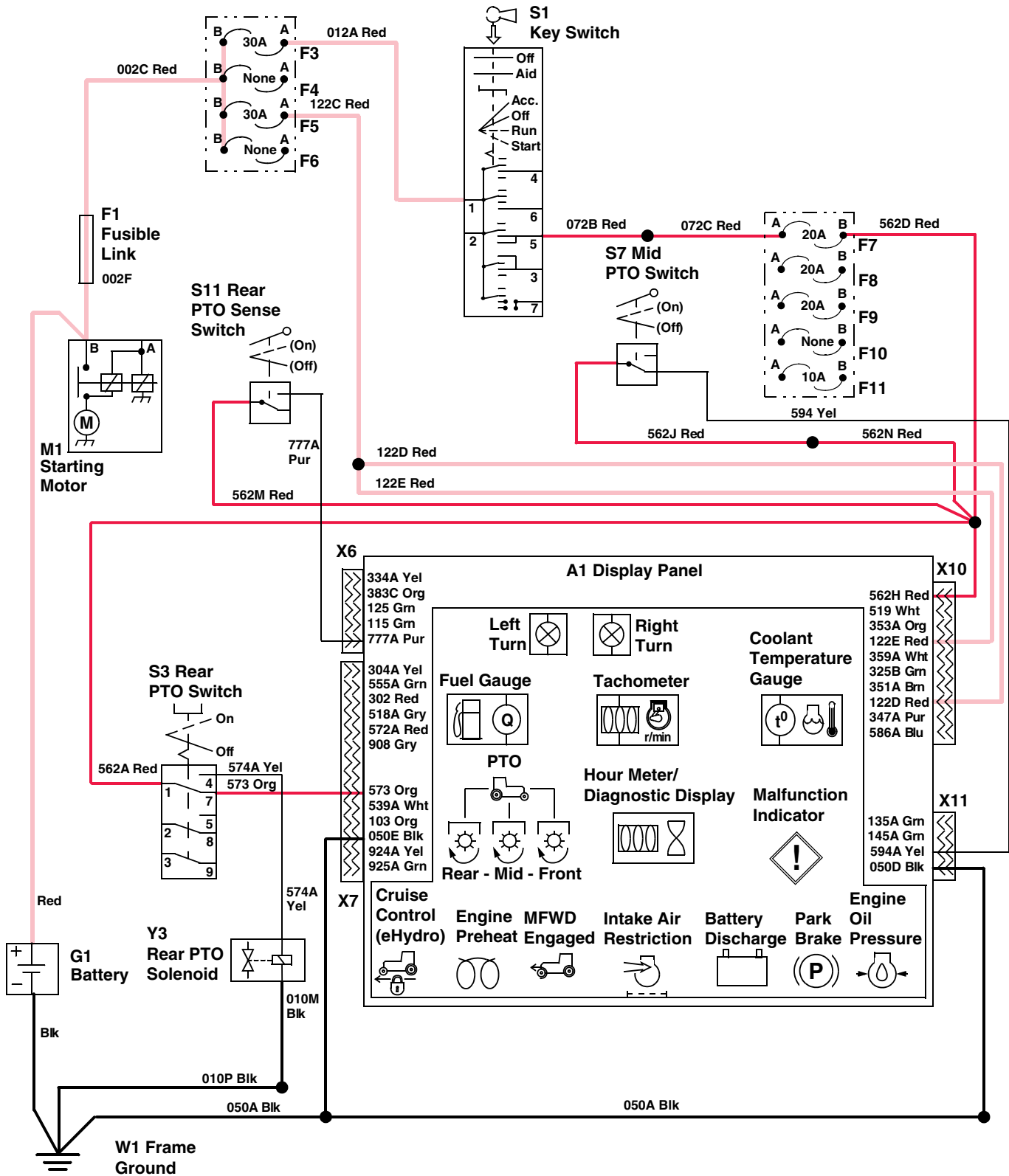
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KN52281,1004426 -19-02NOV12-1/2

A1—Display Panel	F10— Not Used	W1—Frame Ground	X11— W1 Main Wiring
F1— Fusible Link	F11— Fuse 10A	X6— W1 Main Wiring	Harness-to-A1 Display
F3— Fuse 30A	G1—Battery	Harness-to-A1 Display Panel	Panel
F4— Not Used	M1—Starting Motor	X7— W1 Main Wiring	Y3—Rear PTO Solenoid
F5— Fuse 30A	S1— Key Switch	Harness-to-A1 Display Panel	
F6— Not Used	S3— Rear PTO Switch	X10— W1 Main Wiring	
F7— Fuse 20A	S7— Mid PTO Switch	Harness-to-A1 Display	
F8— Fuse 20A	S11— Rear PTO Sense Switch	Panel	
F9— Fuse 20A			

KN52281,1004426 -19-02NOV12-2/2

Rear and Mid PTO Circuit Electrical Schematic—MY08



LVAL11626—UN—02NOV10

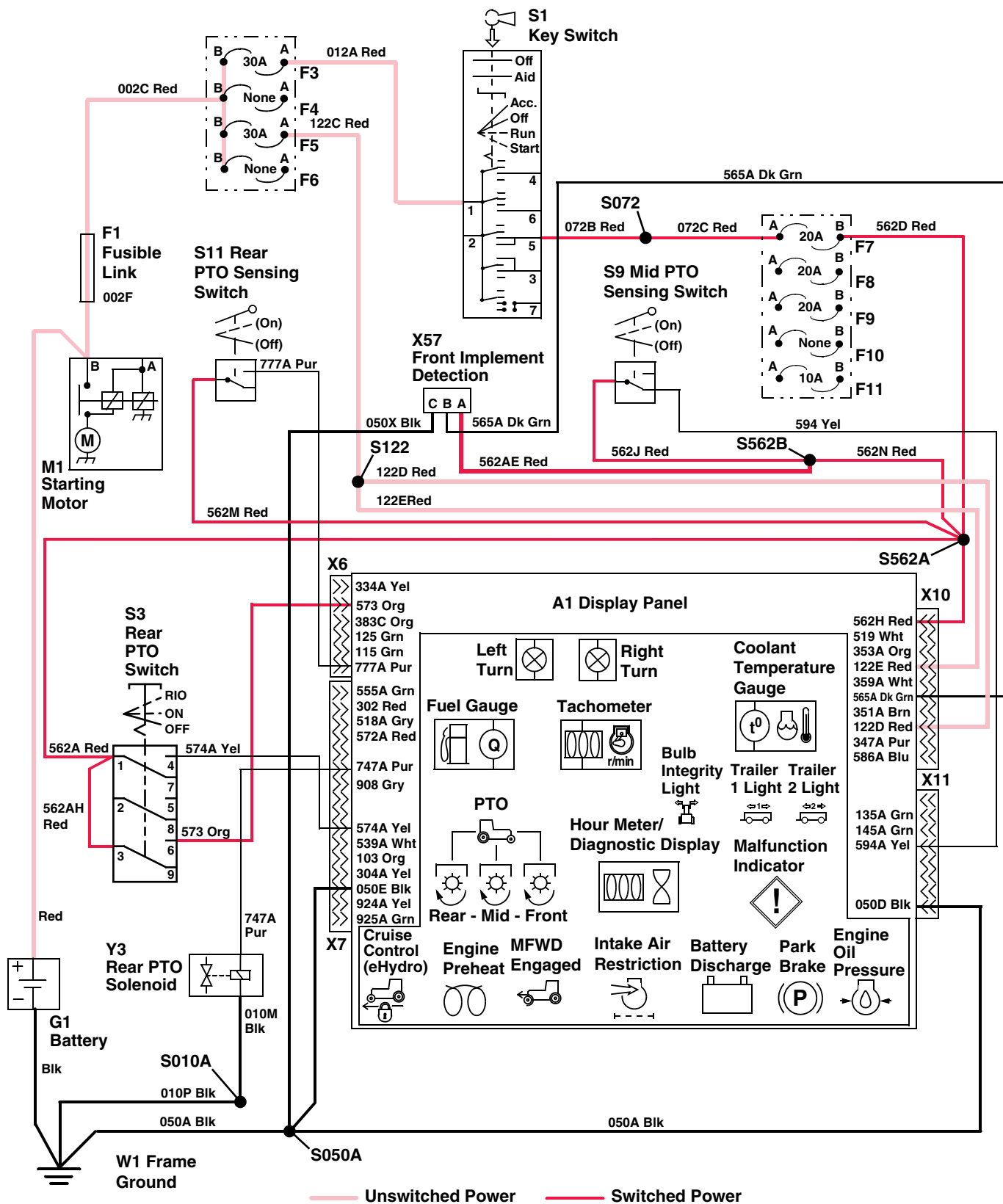
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KN52281,1004427 -19-02NOV12-1/2

A1—Display Panel	F10— Not Used	W1—Frame Ground	X11— W1 Main Wiring
F1— Fusible Link	F11— Fuse 10A	X6— W1 Main Wiring	Harness-to-A1 Display
F3— Fuse 30A	G1—Battery	Harness-to-A1 Display Panel	Panel
F4— Not Used	M1—Starting Motor	X7— W1 Main Wiring	Y3—Rear PTO Solenoid
F5— Fuse 30A	S1— Key Switch	Harness-to-A1 Display Panel	
F6— Not Used	S3— Rear PTO Switch	X10— W1 Main Wiring	
F7— Fuse 20A	S7— Mid PTO Switch	Harness-to-A1 Display	
F8— Fuse 20A	S11— Rear PTO Sense Switch	Panel	
F9— Fuse 20A			

KN52281,1004427 -19-02NOV12-2/2

Rear and Mid PTO Circuit Electrical Schematic—MY13



LVAL38728—UN—17JAN13

Continued on next page

KN52281,1004428 -19-10DEC12-1/2

A1—Display Panel
F1—Fusible Link
F3—Fuse 30A
F4—Not Used
F5—Fuse 30A
F6—Not Used
F7—Fuse 20A
F8—Fuse 20A
F9—Fuse 20A
F10—Not Used

F11—Fuse 10A
G1—Battery
M1—Starting Motor
S1—Key Switch
S3—Rear PTO Switch
S7—Mid PTO Switch
S11—Rear PTO Sense Switch
W1—Frame Ground

X6—W1 Main Wiring
Harness-to-A1 Display Panel
X7—W1 Main Wiring
Harness-to-A1 Display Panel
X10—W1 Main Wiring
Harness-to-A1 Display
Panel

X11—W1 Main Wiring
Harness-to-A1 Display
Panel
X57—Front Hitch Detector
Y3—Rear PTO Solenoid

KN52281,1004428 -19-10DEC12-2/2

Rear and Mid PTO Circuit Diagnosis

Test Procedure A

Test Conditions:

- Right rear wheel removed for easier access to rear PTO solenoid.

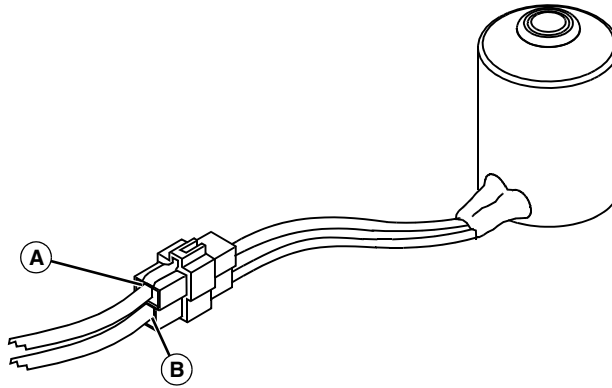
- Park brake locked.
- Transmission in neutral.
- Key switch in run position, engine running.
- Operator off seat, off seat PTO logic activated. (See [Fuel Supply/Engine Shutoff Circuit Operation.](#))
- Rear PTO on.

KN52281,1004429 -19-18DEC12-1/11

Rear PTO Solenoid Test

KN52281,1004429 -19-18DEC12-2/11

Step 1



LVAL11627 —UN—02NOV10

A—Y3 Rear PTO Solenoid, 574 Yel Wire

B—Y3 Rear PTO Solenoid, 010M Blk Wire

Is battery voltage present at the Y3 rear PTO solenoid, 574 Yel wire (A)?

YES: Go to next step.

NO: Test rear PTO switch. Check 574 Yel wire and connections.

KN52281,1004429 -19-18DEC12-3/11

Step 2

Is continuity to ground present at the Y3 rear PTO solenoid, 010M Blk wire (B)?

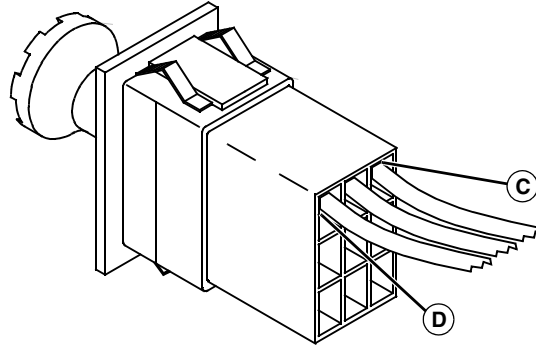
YES: Test rear PTO solenoid. (See [Rear PTO Solenoid Tests.](#)) If OK, and rear PTO does not function, see "PTO Repair" in Final Drive Section.

NO: Check 010M and 010P Blk wires and connections.

Continued on next page

KN52281,1004429 -19-18DEC12-4/11

Step 3



LVAL11628—UN—02NOV10

C—S3 Rear PTO Switch, 562A Red Wire

D—S3 Rear PTO Switch, 573 Org Wire

Is battery voltage present at the S3 rear PTO switch, 562A Red wire (C)?

YES: Go to next step.

NO: Test switched power circuit. (See [Power Circuit Diagnosis](#).)

KN52281,1004429 -19-18DEC12-5/11

Step 4

Is battery voltage present at the S3 rear PTO switch, 573 Org wire (D)?

YES: Replace rear PTO switch.

NO: Go to next step.

KN52281,1004429 -19-18DEC12-6/11

Step 5

Is rear PTO light illuminated on display panel?

YES: Test complete. If rear PTO does not function, See PTO Test in Final Drives Section.

NO: Replace display panel.

KN52281,1004429 -19-18DEC12-7/11

Test Procedure B

Test Conditions:

- Park brake off.

- Transmission in neutral.
- Key switch in run position, engine running.
- Operator on seat.
- Mid PTO on.

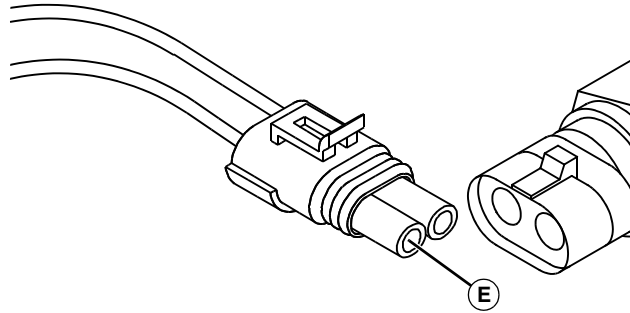
KN52281,1004429 -19-18DEC12-8/11

Mid PTO Switch Test

Continued on next page

KN52281,1004429 -19-18DEC12-9/11

Step 1



LVAL11629 —UN—02NOV10

E—S9 Mid PTO Switch, 562L Red Wire

Is battery voltage present at 562L Red wire (E) of S9 mid PTO switch?

YES: Go to next step.

NO: Check 562L, 562N, and 562D Red wires and connections. Check switched power circuit. (See [Power Circuit Operation](#).)

KN52281,1004429 -19-18DEC12-10/11

Step 2

Is battery voltage present at 594 Yel wire of A1 display panel?

YES: Replace A1 display panel.

NO: Check 594 Yel wire and connections. If OK, replace S9 mid PTO switch.

KN52281,1004429 -19-18DEC12-11/11

Rear and Mid PTO Circuit Diagnosis—MY13

Test Procedure A

Test Conditions

- Right rear wheel removed for easier access to rear PTO solenoid.
- Park brake locked.

- Transmission in neutral.
- Key switch in RUN position, engine running.
- Operator off seat, off-seat PTO logic activated. (See [Fuel Supply/Engine Shutoff Circuit Operation—MY13](#) in Section 40, Group 40.)
- PTO selector lever at TOP / REARWARD position (rear PTO on, mid PTO off).
- S3 Rear PTO switch in ON position.

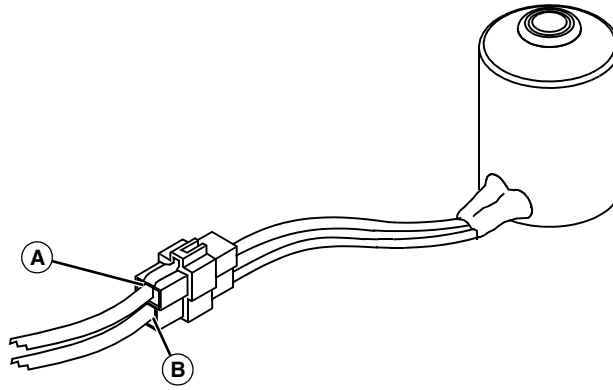
KN52281,100442A -19-21JAN13-1/23

Rear PTO Solenoid Test

Continued on next page

KN52281,100442A -19-21JAN13-2/23

Step 1



LVAL11627 —UN—02NOV10

A—Y3 Rear PTO Solenoid, 747A Pur Wire

B—Y3 Rear PTO Solenoid, 010M Blk Wire

Is battery voltage present at the 747A Pur wire (A) on Y3 rear PTO solenoid?

YES: Check 010M and 010P Blk wires and connections (B). If OK, test rear PTO solenoid. (See [Rear PTO Solenoid Test](#) in Section 40, Group 45.)

NO: Go to next step.

KN52281,100442A -19-21JAN13-3/23

Step 2

Is battery voltage present at terminal F (747A Pur wire) on the X7 connector of the A1 display panel?

YES: Check 747A Pur wire and connections.

NO: Go next step.

KN52281,100442A -19-21JAN13-4/23

Step 3

Is battery voltage present at terminal K (574A Yel wire) on the X7 connector of the A1 display panel?

YES: Check input from S11 rear PTO sensing switch. (See [Rear PTO Sensing Switch Test](#).)

Check inputs to the display panel from seat switch and park brake. (See [Fuel Supply/Engine Shutoff Circuit Diagnosis—MY13](#) in Section 40, Group 40.)

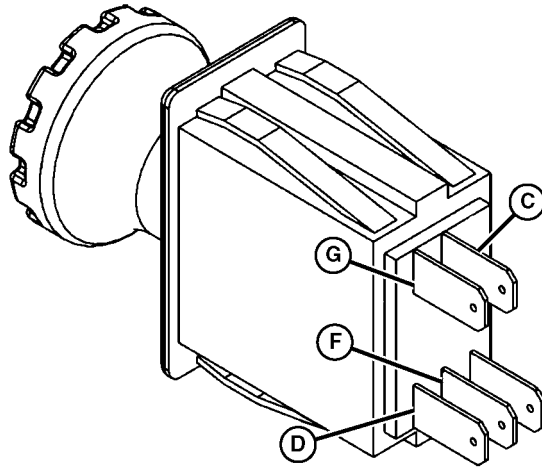
Check input from S11 rear PTO sensing switch. (See [Rear PTO Sensing Switch Test 1](#).)

NO: Go to next step.

Continued on next page

KN52281,100442A -19-21JAN13-5/23

Step 4



LVAL38964 —UN—17JAN13

S3 Rear PTO Switch

- C—Terminal 6—573 Org Wire**
- D—Terminal 1—562A and 562AH Red Wires**
- F—Terminal 4—574A Yel Wire**
- G—Terminal 3—562AH Red Wire**

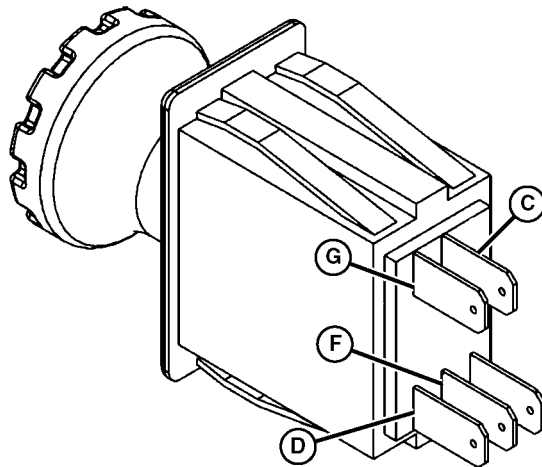
Is battery voltage present at terminal 4 (574A Yel wire) (F) on S3 rear PTO switch?

YES: Check the 574A Yel wire and connections.

NO: Go to next step.

KN52281,100442A -19-21JAN13-6/23

Step 5



LVAL38964 —UN—17JAN13

S3 Rear PTO Switch

- C—Terminal 6—573 Org Wire**
- D—Terminal 1—562A and 562AH Red Wires**
- F—Terminal 4—574A Yel Wire**
- G—Terminal 3—562AH Red Wire**

Is battery voltage present at terminals 1 and 3 (562A and 562AH Red wires) (D and G) on S3 rear PTO switch?

YES: Replace rear PTO switch.

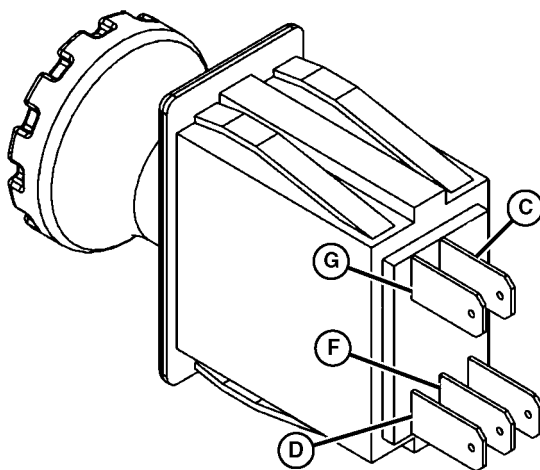
NO: Test switched power circuit. (See [Power Circuit Diagnosis—MY13—NA](#) in Section 40, Group 40.)

Go to next step.

Continued on next page

KN52281,100442A -19-21JAN13-7/23

Step 6



LVAL38964 —UN—17JAN13

S3 Rear PTO Switch

- C—Terminal 6—573 Org Wire**
- D—Terminal 1—562A and 562AH Red Wires**
- F—Terminal 4—574A Yel Wire**
- G—Terminal 3—562AH Red Wire**

With rear PTO switch pulled to the RIO position, is battery voltage present at terminal 6 (573 Org wire) (C) on S3 rear PTO switch?

YES: Go to next step.

NO: Replace rear PTO switch.

KN52281,100442A -19-21JAN13-8/23

Step 7

With rear PTO switch pulled to the RIO position, is battery voltage present at terminal B (573 Org wire) on the X6 connector of the A1 display panel?

YES: Go to [Rear PTO Sensing Switch Test](#).

NO: Check 573 Org wire and connections.

KN52281,100442A -19-21JAN13-9/23

Test Procedure B

Test Conditions

- Park brake locked.
- Transmission in neutral.
- Key switch in RUN position, engine running.

- Operator off seat, off-seat PTO logic activated. (See [Fuel Supply/Engine Shutoff Circuit Operation—MY13](#) in Section 40, Group 40.)
- PTO selector lever at TOP / REARWARD position (rear PTO on).
- S3 Rear PTO switch in ON position.

KN52281,100442A -19-21JAN13-10/23

Rear PTO Sensing Switch Test

KN52281,100442A -19-21JAN13-11/23

Step 1

Is rear PTO indicator light illuminated on display panel?

YES: Test complete. If rear PTO does not function, see PTO Test in Final Drives section.

NO: Go to next step.

KN52281,100442A -19-21JAN13-12/23

Step 2

Is battery voltage present at terminal F on the X6 connector (777A Pur wire) of A1 display panel?

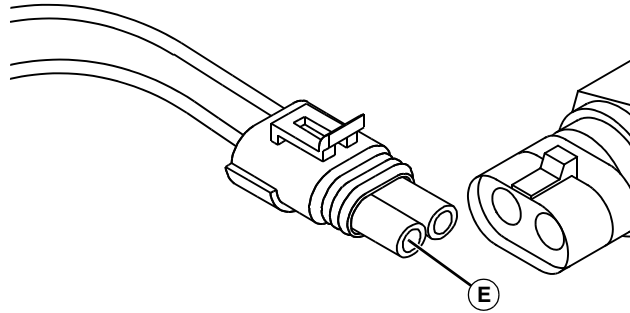
YES: Replace A1 display panel.

NO: Go to next step.

KN52281,100442A -19-21JAN13-13/23

Continued on next page

Step 3



LVAL11629 —UN—02NOV10

E—S11 Rear PTO Sensing Switch, 562M Red Wire

Is battery voltage present at 562M Red wire (E) of S11 rear PTO sensing switch?

YES: Check S11 rear PTO sensing switch. (See [Sensing Switch Test](#) in Section 40, Group 45.)

If OK, check 777A Pur wire and connections.

NO: Check 562M and 562D Red wires and connections. Check switched power circuit. (See [Power Circuit Diagnosis—MY13—NA](#) in Section 40, Group 40.)

KN52281,100442A -19-21JAN13-14/23

Test Procedure C

Test Conditions

- Park brake off.
- Transmission in neutral.

- Key switch in RUN position, engine running.
- Operator on seat.
- PTO selector lever at BOTTOM / FORWARD position (mid PTO on).
- S3 Rear PTO switch in ON position.

KN52281,100442A -19-21JAN13-15/23

Mid PTO Sensing Switch Test 1

KN52281,100442A -19-21JAN13-16/23

Step 1

Is the mid PTO indicator light illuminated on display panel?

YES: Go to [Mid PTO Sensing Switch Test 2](#).

NO: Go to next step.

KN52281,100442A -19-21JAN13-17/23

Step 2

Is battery voltage present at terminal D on the X11 connector (594A Yel wire) of A1 display panel?

NOTE: For the display panel to illuminate the mid PTO indicator light, voltage must not be present at terminal D on X11 connector (594A Yel wire) when the mid PTO is engaged.

YES: Check S9 Mid PTO sensing switch. (See [Sensing Switch Test](#) in Section 40, Group 45.)

If OK, check the 594A Yel wire for short to power.

NO: If the mid PTO engages, but mid PTO indicator light does not illuminate, replace display panel.

Continued on next page

KN52281,100442A -19-21JAN13-18/23

Test Procedure D

Test Conditions

- Park brake off.
- Transmission in neutral.
- Key switch in RUN position, engine running.
- Operator on seat.
- PTO selector lever at TOP / REARWARD position (mid PTO off).
- S3 Rear PTO switch in ON position.

KN52281,100442A -19-21JAN13-19/23

Mid PTO Sensing Switch Test 2

KN52281,100442A -19-21JAN13-20/23

Step 1

Is the mid PTO indicator light off?

YES: Test complete.

NO: Go to next step.

KN52281,100442A -19-21JAN13-21/23

Step 2

Is battery voltage present at terminal D on X11 connector (594A Yel wire) of A1 display panel?

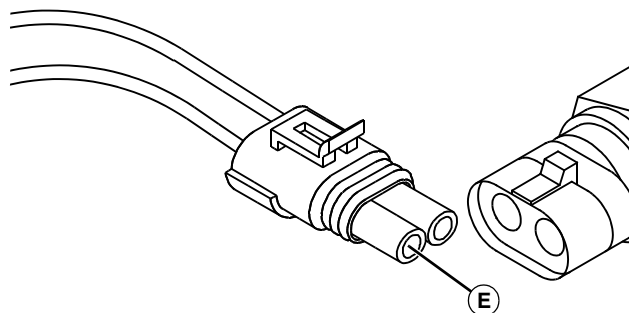
NOTE: For the mid PTO indicator light to be off, battery voltage must be present at terminal D on the X11 connector (594A Yel wire) when the mid PTO is not engaged.

YES: Replace A1 display panel.

NO: Go to next step.

KN52281,100442A -19-21JAN13-22/23

Step 3



IVAL11629—UNL—02NOV10

E—S9 Mid PTO Sensing Switch, 562L Red Wire

Is battery voltage present at 562L Red wire (E) of S9 mid PTO sensing switch?

YES: Check S9 mid PTO sensing switch. (See [Sensing Switch Test](#) in Section 40, Group 45.)

If OK, check 594A Yel wire and connections.

NO: Check 562L, 562N, and 562D Red wires and connections. Check switched power circuit. (See [Power Circuit Diagnosis—MY13—NA](#) in Section 40, Group 40.)

KN52281,100442A -19-21JAN13-23/23

MFWD Circuit Operation

Function:

To illuminate a light on the display panel to alert the operator that the MFWD is engaged.

Operating Conditions:

- Key switch in RUN position, and
- MFWD lever in the ENGAGED position, (S7 MFWD engagement sensing switch closed).

Theory of Operation:

The MFWD function is a mechanical system that uses a ball switch to turn a light on and off on the display panel to alert the operator that the MFWD is engaged.

When the key is in the RUN or START position, battery voltage is provided to the S7 MFWD engagement sensing

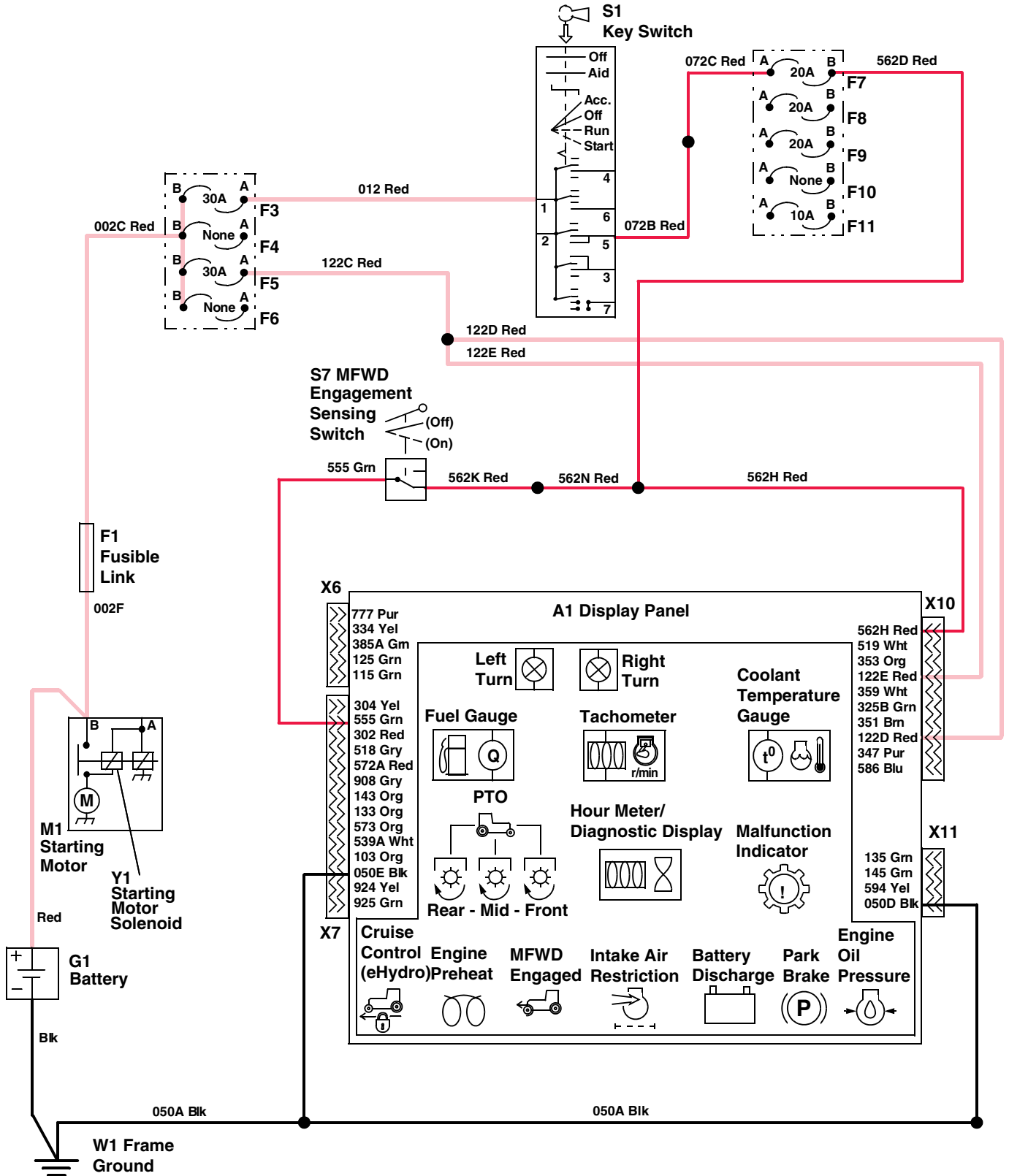
switch through the S1 key switch, 072B and 072C Red wires, F7 fuse and 562D, 562N, and 562K Red wires to the MFWD engagement sensing switch.

When the MFWD lever is pulled up to the ENGAGED position, the ball of the switch is pushed in to close the contacts inside the switch. With the switch contacts closed, current flows across the MFWD engagement sensing switch through the 555 Grn wire and X7 connector (terminal B) to the A1 display panel to illuminate the MFWD indicator light.

A ground circuit path for the display panel is provided to terminal P (050E Blk wire) on the X7 connector and to terminal H (050D Blk wire) on the X11 connector. Both are spliced to the 050A Blk wire, which is connected to W1 frame ground.

KN52281,100442B -19-15JAN13-1/1

MFWD Circuit Electrical Schematic—Pre MY08



LVAL11630—UN—02NOV10

Continued on next page

KN52281,100442C -19-02NOV12-1/2

A1—Display Panel
 F1— Fusible Link
 F3— Fuse 30A
 F4— Not Used
 F5— Fuse 30A
 F6— Not Used
 F7— Fuse 20A
 F8— Fuse 20A
 F9— Fuse 20A

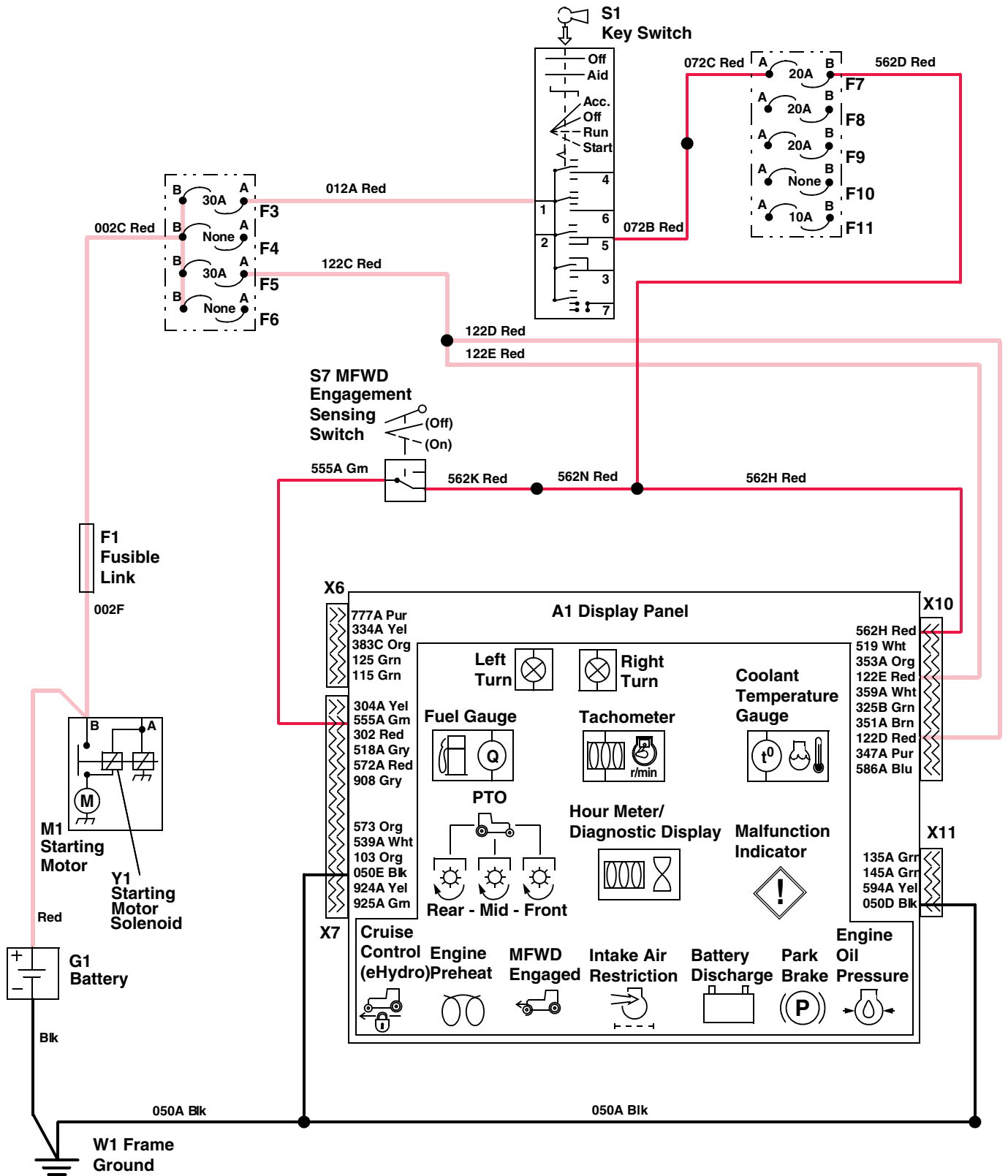
F10— Not Used
 F11— Fuse 10A
 G1—Battery
 M1—Starting Motor
 S1— Key Switch
 S7— MFWD Engagement Sensing
 Switch
 W1—Frame Ground

X6— W1 Main Wiring
 Harness-to-A1 Display Panel
 X7— W1 Main Wiring
 Harness-to-A1 Display Panel
 X10— W1 Main Wiring
 Harness-to-A1 Display
 Panel

X11— W1 Main Wiring
 Harness-to-A1 Display
 Panel
 Y1— Starting Motor Solenoid

KN52281,100442C -19-02NOV12-2/2

MFWD Circuit Electrical Schematic—MY08



LVAL11631—UN—02NOV10

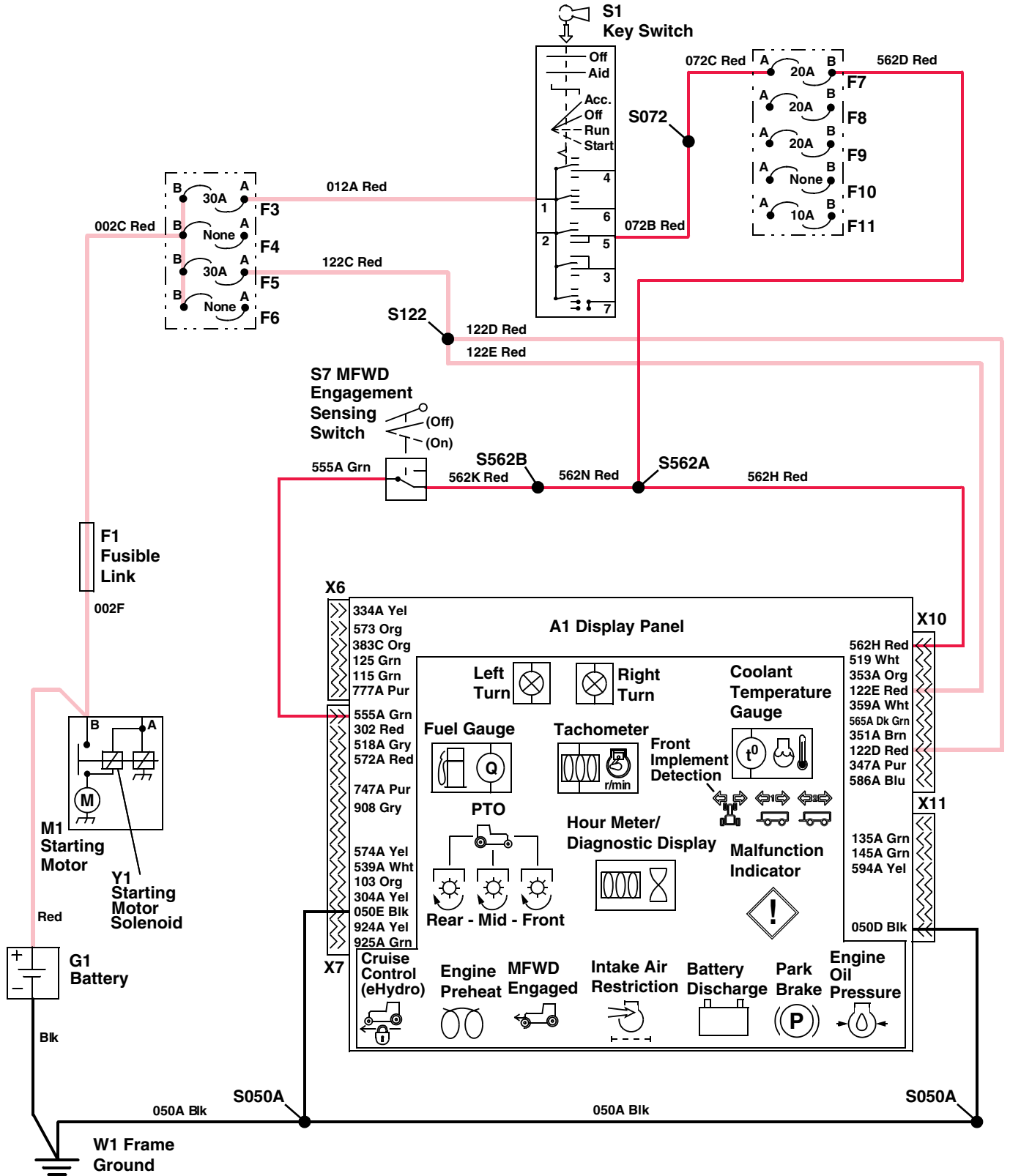
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KN52281,100442D -19-02NOV12-1/2

A1—Display Panel	F10— Not Used	X6— W1 Main Wiring	X11— W1 Main Wiring
F1— Fusible Link	F11— Fuse 10A	Harness-to-A1 Display Panel	Harness-to-A1 Display
F3— Fuse 30A	G1—Battery	X7— W1 Main Wiring	Panel
F4— Not Used	M1—Starting Motor	Harness-to-A1 Display Panel	Y1—Starting Motor Solenoid
F5— Fuse 30A	S1— Key Switch	X10— W1 Main Wiring	
F6— Not Used	S7— MFWD Engagement Sensing	Harness-to-A1 Display	
F7— Fuse 20A	Switch	Panel	
F8— Fuse 20A	W1—Frame Ground		
F9— Fuse 20A			

KN52281,100442D -19-02NOV12-2/2

MFWD Circuit Electrical Schematic—MY13



LVAL38729—UN—16OCT12

Continued on next page

KN52281,100442E -19-10DEC12-1/2

A1—Display Panel
F1—Fusible Link
F3—Fuse 30A
F4—Not Used
F5—Fuse 30A
F6—Not Used
F7—Fuse 20A
F8—Fuse 20A
F9—Fuse 20A

F10— Not Used
F11— Fuse 10A
G1—Battery
M1—Starting Motor
S1—Key Switch
S7—MFWD Engagement Sensing Switch
W1—Frame Ground

X6—W1 Main Wiring Harness-to-A1 Display Panel
X7—W1 Main Wiring Harness-to-A1 Display Panel
X10— W1 Main Wiring Harness-to-A1 Display Panel

X11— W1 Main Wiring Harness-to-A1 Display Panel
Y1—Starting Motor Solenoid

KN52281,100442E -19-10DEC12-2/2

MFWD Circuit Diagnosis

Test Procedure A

Test Conditions:

- Park brake locked.
- Key switch in the run position, engine off.
- MFWD engaged.

KN52281,100442F -19-02NOV12-1/4

MFWD Indicator Circuit

KN52281,100442F -19-02NOV12-2/4

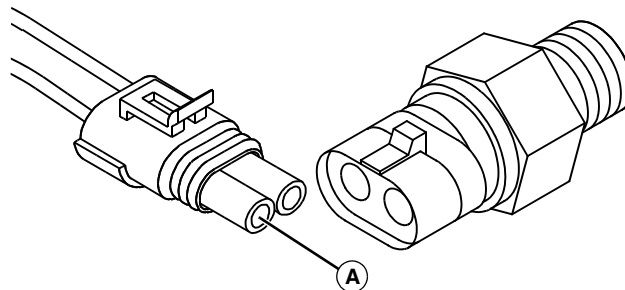
Step 1

Is MFWD indicator light illuminated?

YES: Circuit is functional. If MFWD is not engaged, see Final Drive Section.
NO: Test MFWD engagement sensing switch. (See [Sensing Switch Test](#) in Section 40, Group 40.) Check 555A Grn wire and connections. If OK, and light does not illuminate, replace display panel.

KN52281,100442F -19-02NOV12-3/4

Step 2



LVAL11632 —UN—18NOV10

A—S7 MFWD Engagement Sensing Switch, 562K Red Wire

Is battery voltage present at the S7 MFWD engagement sensing switch, 562K Red wire (A)?

YES: Test complete.

NO: Test switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

KN52281,100442F -19-02NOV12-4/4

Light Circuit Operation

Function:

Provides current to the headlights, tail lights, hazard lights, and work lights in combinations depending upon the position the light switch is placed in.

Operating Conditions:

- Light switch in either hazard, road or field position.

Theory of Operation:

Power for the light switch is unswitched and provided through the F5 fuse, 122C and 122B Red wires.

Light Switch Hazard Position:

In the hazard position, voltage is provided from the light switch (terminal 2) through the 103 Org wire to the A1 display panel.

NOTE: Brackets [] indicate wire suffixes are only on MY08 and MY13 wiring.

From the display panel, intermittent voltage is provided to both the 135[A] and 145[A] Grn wires. Wire 135[A] Grn provides intermittent current to the right hazard light while wire 145[A] Grn provides intermittent current to the left hazard light.

If the output from the display panel to the hazard lights is faulty for some reason, a fault code will appear on the display panel.

Err64 and Err65 indicate a fault on the right hazard light.

Err66 and Err67 indicate a fault on the left hazard light.

Err64 (right) and Err66 (left) indicate a short to ground. Check the 135[A] and 145[A] Grn wires for a pinch to the frame or other ground wire, or corrosion causing a short to the frame or other ground wires.

Err65 (right) and Err67 (left) indicate a short to battery voltage or an open circuit on wires 135[A] and 145[A] Grn. Check for a defective bulb, a broken wire to or from the hazard lights, or wires 135[A] or 145[A] Grn shorted to a wire with battery voltage present.

Grounds for the hazard lights are provided by connectors X21 (left), X18 (right) and 010 Blk series of wires.

Light Switch Road Position:

In the road position, voltage continues to be provided from the light switch (terminal 2) to the hazard light circuits.

Pre MY08: Voltage is provided from the light switch (terminal 3) through the 138 Gry wire to the F9 fuse. The F9 fuse provides voltage to the headlights through the 119 Wht wire to the X3 connector, feeding the 119A Wht wire of the W2 headlight harness. The 119A Wht wire splices to the 119B and 119C Wht wires. The 119B Wht wire connects the left headlight E1. The 119C Wht wire connects the right headlight E2.

The ground path for the headlights is provided by connector X3 and 010 Blk series of wires.

MY08/MY13: Voltage from the light switch (terminal 3) flows through the 138A Gry wire to the F9 fuse. Power from the F9 fuse travels via the 119A Wht wire to a splice with the 119C, 119D and 119E Wht wires. The 119C Wht wire goes to connector X3, feeding the 119 Wht wire of the W2 headlight harness. The 119 Wht wire wire splices to the 119B and 119C Wht wires. The 119B Wht wire connects the left headlight E1. The 119C Wht wire connects the right headlight E2.

The ground path for the headlights is provided by connector X3 and 010 Blk series of wires.

The 119D and 119E Wht wires provide power to the tail lights. Wire 119D Wht feeds connector X20 for the left tail light E8. Wire 119E Wht feeds connector X17 for the right tail light E7.

Ground paths for the tail lights are provided by connectors X21 (left), X18 (right) and 010 Blk series of wires.

Light Switch Field Position:

In the field position, power continues to be provided for the headlights and tail lights. Voltage is removed from the hazard lights circuit and is now provided to the work lights.

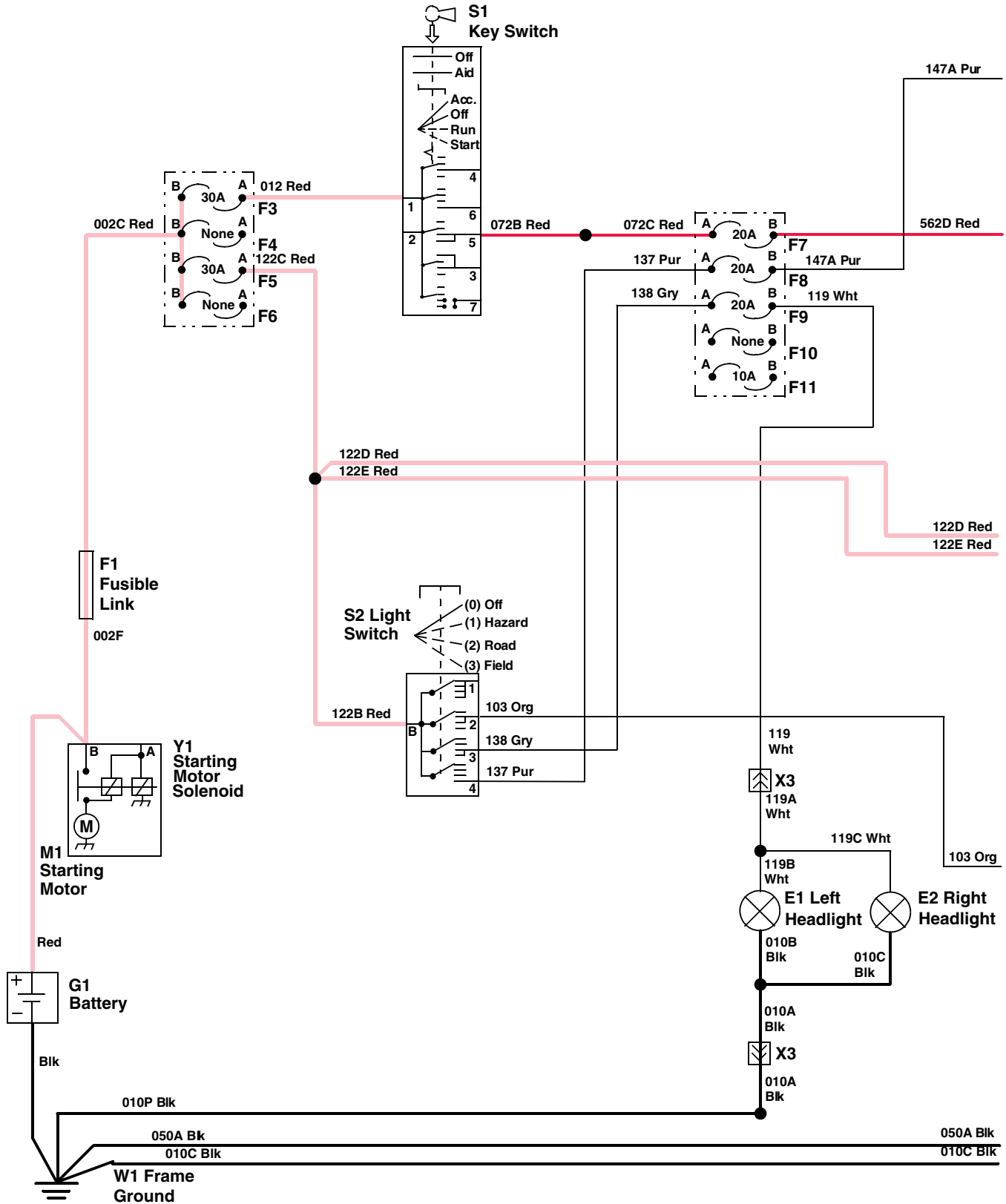
NOTE: Brackets [] indicate wire suffixes are only on MY08 and MY13 wiring.

Voltage from the light switch (terminal 4) flows from the 137[A] Pur wire to the F8 fuse. The F8 fuse provides power to the work lights via the 147A Pur wire. The 147A Pur wire splices to the 147B and 147C Pur wires. The 147B Pur wire feeds connector X12 for the right work light E3. The 147C Pur wire feeds connector X14 for the left work light E4.

Ground paths for the work lights are provided by connectors X13 (right), X15 (left) and 010 Blk series of wires.

KN52281,1004430 -19-16JAN13-1/1

Lights Circuit Electrical Schematic—Pre MY08



LVAL11633 —UN—02NOV10

Continued on next page

KN52281,1004431 -19-02NOV12-1/4

E1—Left Headlight
E2—Right Headlight
F1—Fusible Link
F3—Fuse 30A
F4—Not Used
F5—Fuse 30A

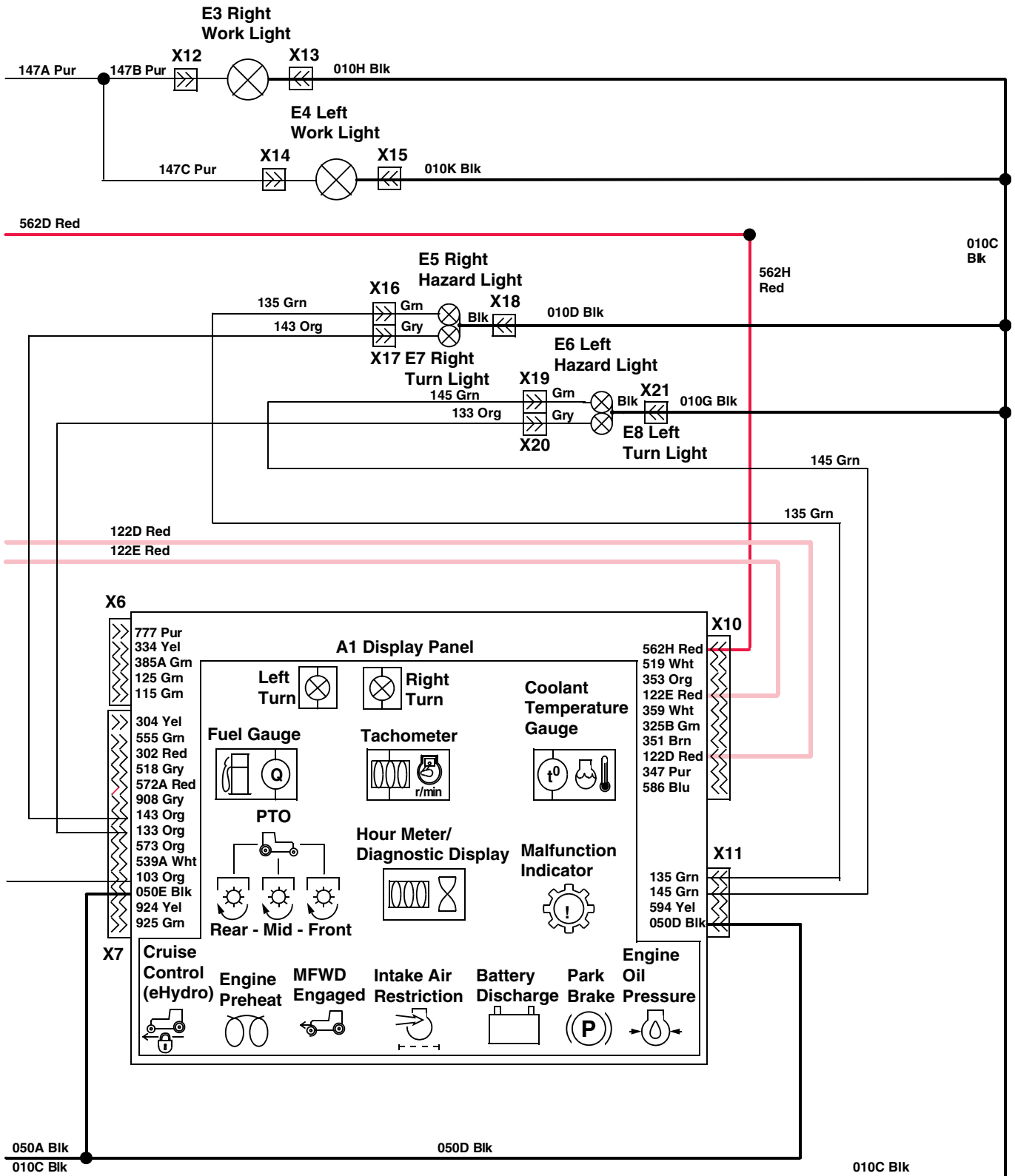
F6—Not Used
F7—Fuse 20A
F8—Fuse 20A
F9—Fuse 20A
F10—Not Used
F11—Fuse 10A
G1—Battery

M1—Starting Motor
S1—Key Switch
S2—Light Switch
W1—Frame Ground
X3—W1 Main Wiring
Harness-to-W2 Headlight
Wiring Harness

Y1—Starting Motor Solenoid

Continued on next page

KN52281,1004431 -19-02NOV12-2/4



LVAL11634—UN—02NOV10

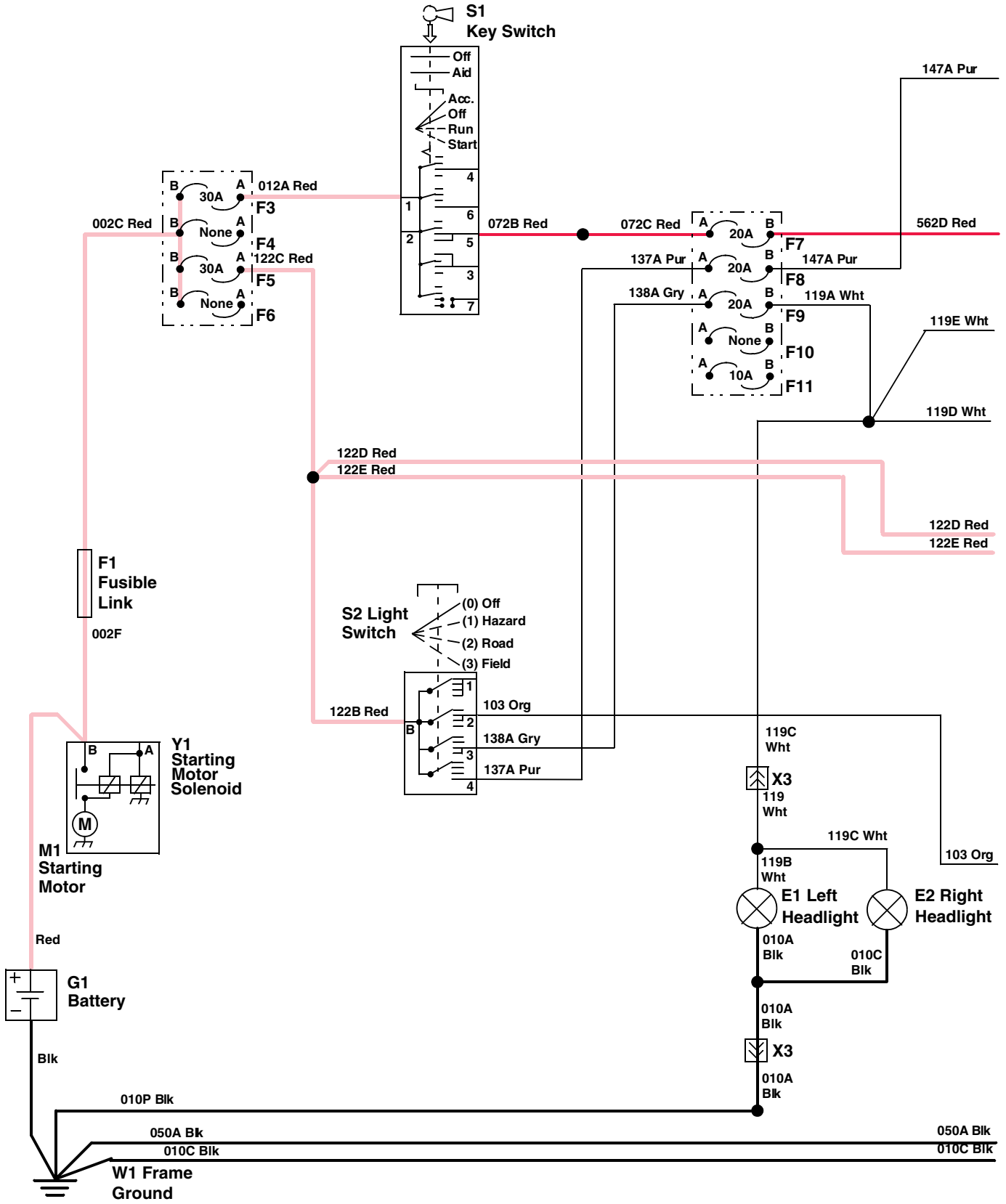
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KN52281,1004431 -19-02NOV12-3/4

A1—Display Panel	X10— W1 Main Wiring Harness-to-A1 Display Panel	X15— W1 Main Wiring Harness to E4 Left Work Light	X20— W1 Main Wiring Harness to E8 Left Tail/Turn Light
E3—Right Work Light		X16— W1 Main Wiring Harness to E5 Hazard Light	X21— W1 Main Wiring Harness to E6/E8 Left Tail/Turn/Hazard Lights
E4—Left Work Light	X11— W1 Main Wiring Harness-to-A1 Display Panel	X17— W1 Main Wiring Harness to E7 Right Tail/Turn Light	
E5—Right Hazard Light		X18— W1 Main Wiring Harness to E5/E7 Right Tail/Turn/Hazard Lights	
E6—Left Hazard Light	X12— W1 Main Wiring Harness to E3 Right Work Light	X19— W1 Main Wiring Harness to E6 Left Hazard Light	
E7—Right Turn Light			
E8—Left Turn Light	X13— W1 Main Wiring Harness to E3 Right Work Light		
X6—W1 Main Wiring Harness-to-A1 Display Panel	X14— W1 Main Wiring Harness to E4 Left Work Light		
X7—W1 Main Wiring Harness-to-A1 Display Panel			

KN52281,1004431 -19-02NOV12-4/4

Lights Circuit Electrical Schematic—MY08



LVAL11635 —UN—02NOV10

Continued on next page

KN52281,1004432 -19-02NOV12-1/4

E1—Left Headlight
E2—Right Headlight
F1—Fusible Link
F3—Fuse 30A
F4—Not Used
F5—Fuse 30A

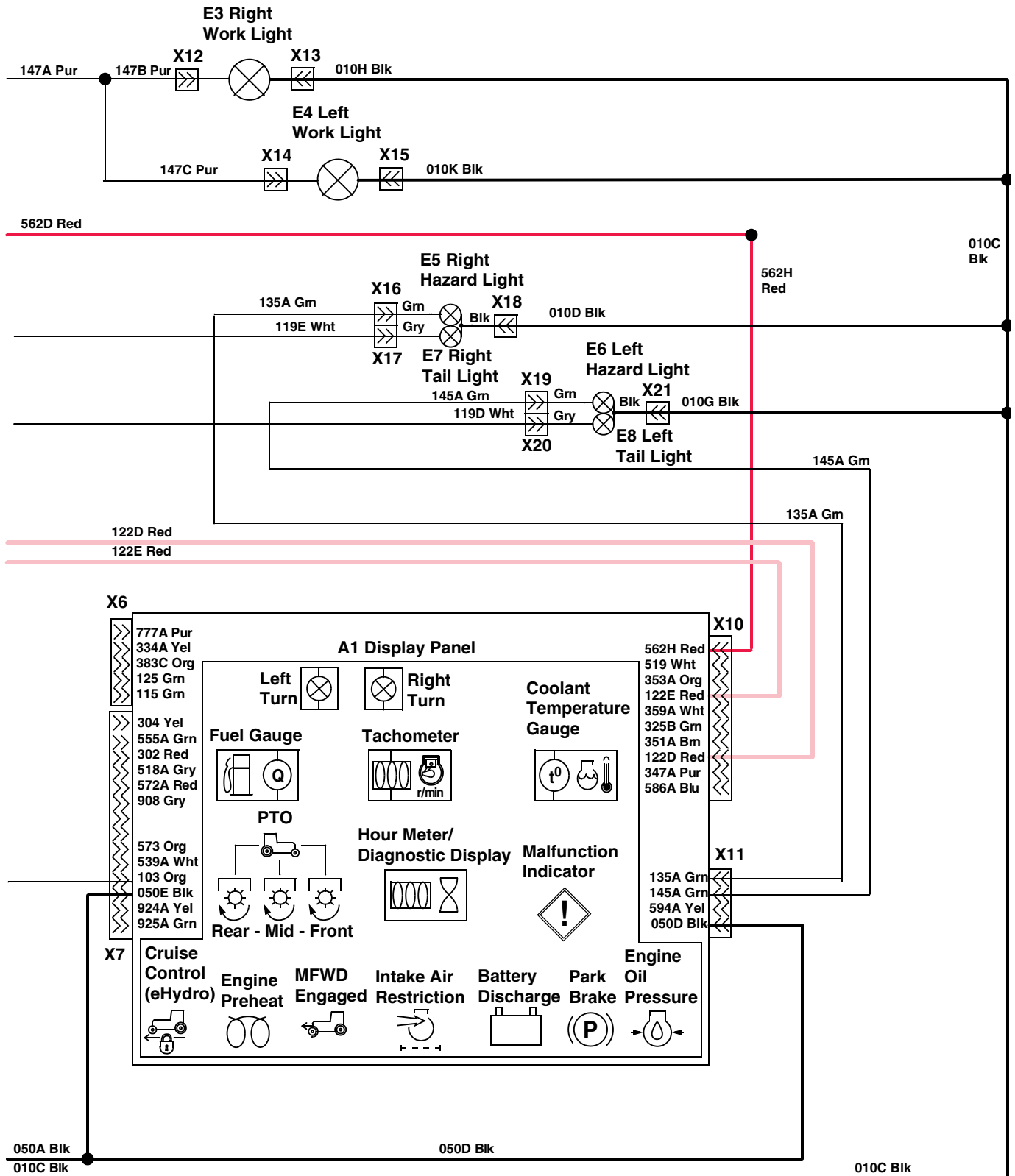
F6—Not Used
F7—Fuse 20A
F8—Fuse 20A
F9—Fuse 20A
F10—Not Used
F11—Fuse 10A
G1—Battery

M1—Starting Motor
S1—Key Switch
S2—Light Switch
W1—Frame Ground
X3—W1 Main Wiring
Harness-to-W2 Headlight
Wiring Harness

Y1—Starting Motor Solenoid

Continued on next page

KN52281,1004432 -19-02NOV12-2/4



LVAL11636—UN—02NOV10

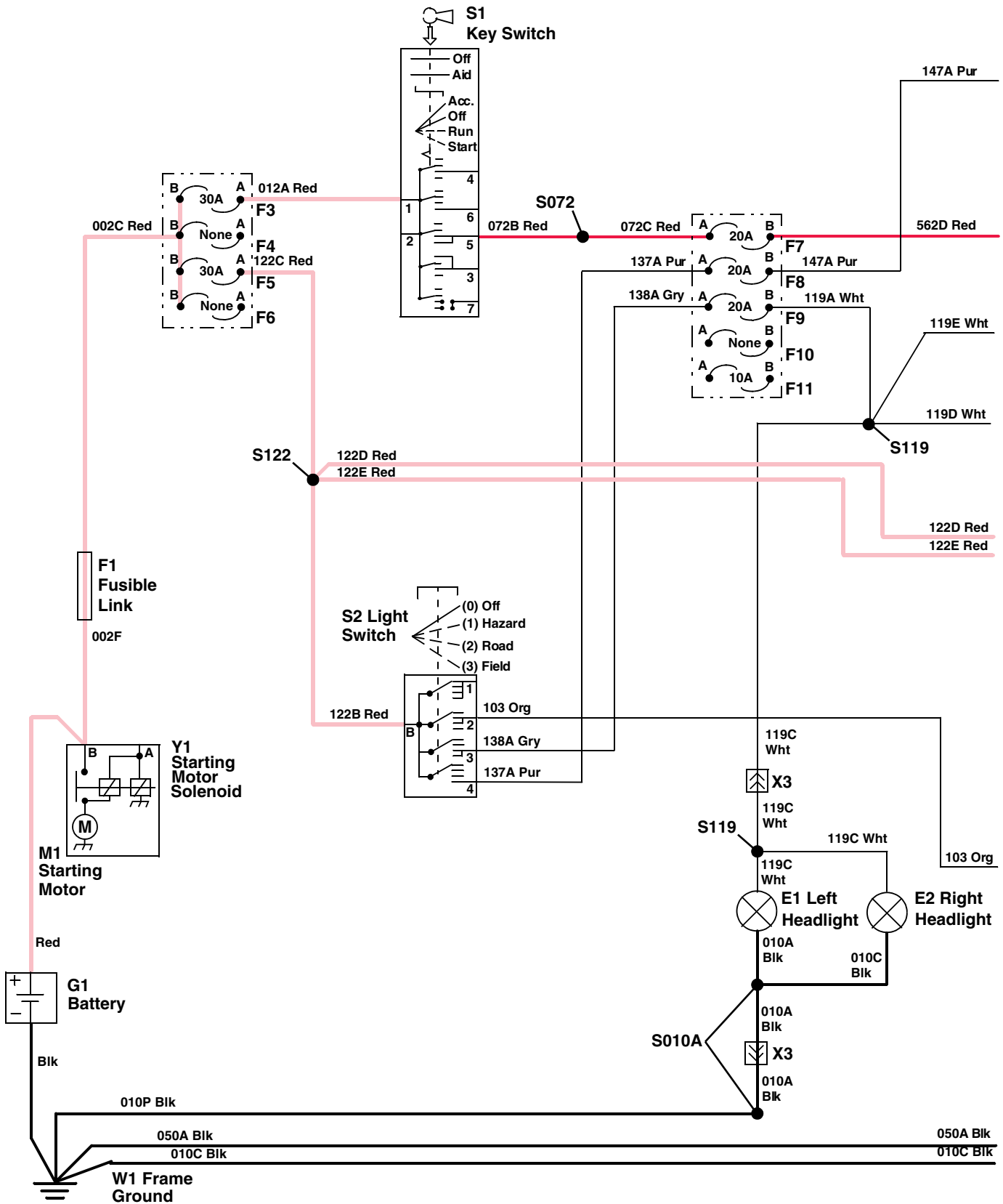
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KN52281,1004432 -19-02NOV12-3/4

A1—Display Panel	X10— W1 Main Wiring Harness-to-A1 Display Panel	X15— W1 Main Wiring Harness to E4 Left Work Light	X20— W1 Main Wiring Harness to E8 Left Tail/Turn Light
E3—Right Work Light		X16— W1 Main Wiring Harness to E5 Hazard Light	X21— W1 Main Wiring Harness to E6/E8 Left Tail/Turn/Hazard Lights
E4—Left Work Light	X11— W1 Main Wiring Harness-to-A1 Display Panel	X17— W1 Main Wiring Harness to E7 Right Tail/Turn Light	
E5—Right Hazard Light		X18— W1 Main Wiring Harness to E5/E7 Right Tail/Turn/Hazard Lights	
E6—Left Hazard Light	X12— W1 Main Wiring Harness to E3 Right Work Light	X19— W1 Main Wiring Harness to E6 Left Hazard Light	
E7—Right Turn Light			
E8—Left Turn Light	X13— W1 Main Wiring Harness to E3 Right Work Light		
X6—W1 Main Wiring Harness-to-A1 Display Panel	X14— W1 Main Wiring Harness to E4 Left Work Light		
X7—W1 Main Wiring Harness-to-A1 Display Panel			

KN52281,1004432 -19-02NOV12-4/4

Lights Circuit Electrical Schematic—MY13



LVAL38730 —UN—16OCT12

Continued on next page

KN52281,1004433 -19-10DEC12-1/4

E1—Left Headlight
E2—Right Headlight
F1—Fusible Link
F3—Fuse 30A
F4—Not Used
F5—Fuse 30A

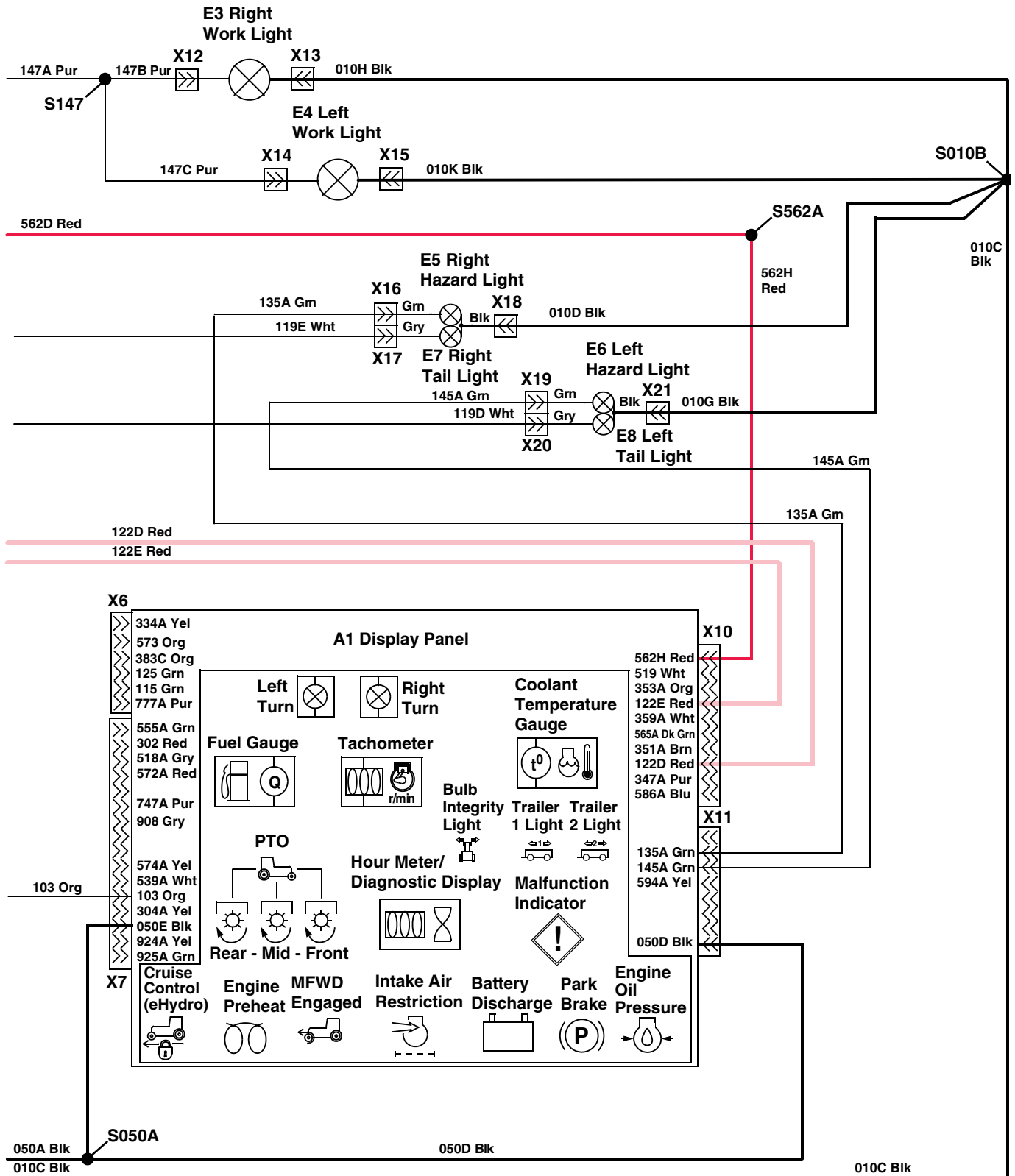
F6—Not Used
F7—Fuse 20A
F8—Fuse 20A
F9—Fuse 20A
F10—Not Used
F11—Fuse 10A
G1—Battery

M1—Starting Motor
S1—Key Switch
S2—Light Switch
W1—Frame Ground
X3—W1 Main Wiring
Harness-to-W2 Headlight
Wiring Harness

Y1—Starting Motor Solenoid

Continued on next page

KN52281,1004433 -19-10DEC12-2/4



LVAL38731—UN—05DEC12

Continued on next page

KN52281,1004433 -19-10DEC12-3/4

A1—Display Panel	X10— W1 Main Wiring Harness-to-A1 Display Panel	X15— W1 Main Wiring Harness to E4 Left Work Light	X20— W1 Main Wiring Harness to E8 Left Tail/Turn Light
E3—Right Work Light		X16— W1 Main Wiring Harness to E5 Hazard Light	X21— W1 Main Wiring Harness to E6/E8 Left Tail/Turn/Hazard Lights
E4—Left Work Light	X11— W1 Main Wiring Harness-to-A1 Display Panel	X17— W1 Main Wiring Harness to E7 Right Tail/Turn Light	
E5—Right Hazard Light		X18— W1 Main Wiring Harness to E5/E7 Right Tail/Turn/Hazard Lights	
E6—Left Hazard Light	X12— W1 Main Wiring Harness to E3 Right Work Light	X19— W1 Main Wiring Harness to E6 Left Hazard Light	
E7—Right Turn Light			
E8—Left Turn Light	X13— W1 Main Wiring Harness to E3 Right Work Light		
X6—W1 Main Wiring Harness-to-A1 Display Panel	X14— W1 Main Wiring Harness to E4 Left Work Light		
X7—W1 Main Wiring Harness-to-A1 Display Panel			

KN52281,1004433 -19-10DEC12-4/4

Lights Circuit Diagnosis

Test Procedure A

NOTE: Test the bulb in each light circuit before beginning the diagnosis steps for the specific circuit.

- Park brake locked.
- Key switch in run position, engine off.
- Light switch in hazard position.
- Check circuit grounds for continuity as tests are performed.

Test Conditions:

KN52281,1004434 -19-02NOV12-1/27

Hazard Lights Circuit

KN52281,1004434 -19-02NOV12-2/27

Step 1

Is right amber light flashing?

YES: Right hazard light circuit is functional.

NO: Go to next step.

KN52281,1004434 -19-02NOV12-3/27

Step 2

Is either fault code Err64 or Err65 showing on the display panel?

YES: Fault code Err64—Check 135 Grn wire for short to ground. Check right hazard bulb.

YES: Fault code Err65—Check right hazard bulb. Check 135 Grn wire for short to battery voltage or open circuit.

NO: Go to next step.

KN52281,1004434 -19-02NOV12-4/27

Step 3

Is left amber light flashing?

YES: Left hazard light circuit is functional.

NO: Go to next step.

Continued on next page

KN52281,1004434 -19-02NOV12-5/27

Step 4

Is either fault code Err66 or Err67 showing on the display panel?

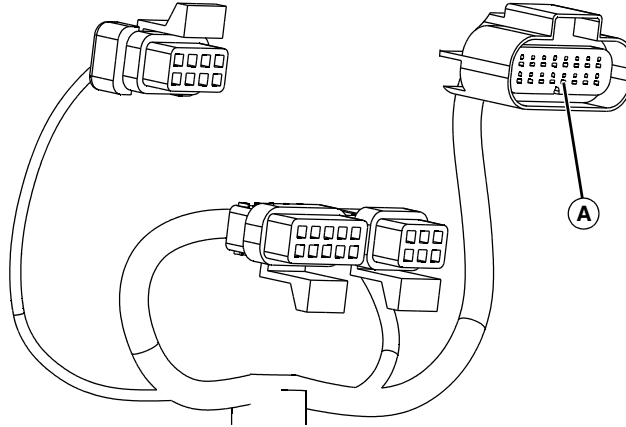
YES: Fault code Err66—Check 145 Grn wire for short to ground. Check left hazard bulb.

YES: Fault code Err67—Check left hazard bulb. Check 145 Grn wire for short to battery voltage or open circuit.

NO: Go to next step.

KN52281,1004434 -19-02NOV12-6/27

Step 5



LVAL11637 —UN—02NOV10

A—X7 Display Panel Terminal M, 103 Org Wire

Disconnect X7 connector to the display panel. Is battery voltage present at terminal M, 103 Org wire (A)?

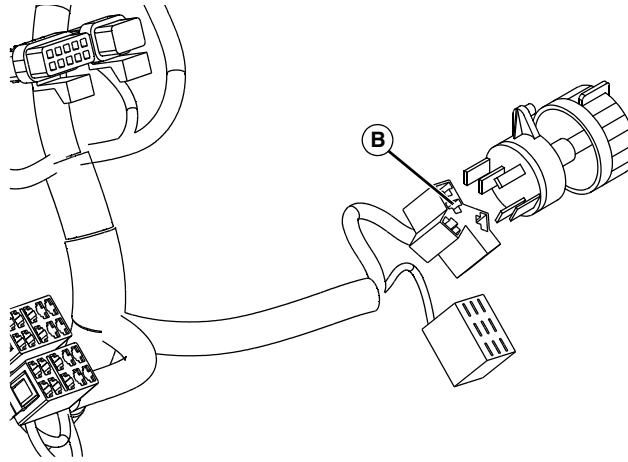
YES: Connect X7 connector. If no output to hazard lights on 135 and 145 Grn wires, replace display panel.

NO: Check 103 Org wire and connections. Test light switch.

Continued on next page

KN52281,1004434 -19-02NOV12-7/27

Step 6



LVAL11638 —UN—02NOV10

B—S2 Light Switch Connector, 122B Red Wire

Disconnect the light switch. Is battery voltage present at S2 light switch connector 122B Red wire (B)?

YES: Circuit is functional.

NO: Test unswitched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.) Connect light switch.

KN52281,1004434 -19-02NOV12-8/27

Test Procedure B

Test Conditions:

- Park brake locked.

- Key switch in off position.
- Light switch in road position.

KN52281,1004434 -19-02NOV12-9/27

Road Lights Circuit

KN52281,1004434 -19-02NOV12-10/27

Step 1

Do the hazard lights flash?

YES: Hazard lights are functional. Go to next step.
NO: (See [Light Circuit Operation](#) in Section 40, Group 35.)

KN52281,1004434 -19-02NOV12-11/27

Step 2

Is right headlight illuminated?

YES: Right headlight circuit is functional.
NO: Test bulb. Go to next step.

KN52281,1004434 -19-02NOV12-12/27

Step 3

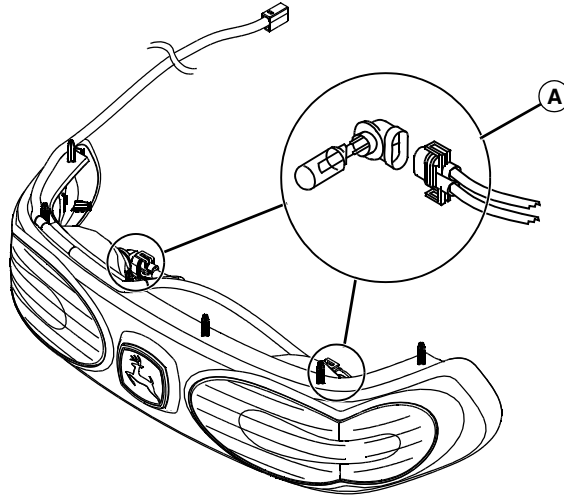
Is left headlight illuminated?

YES: Left headlight circuit is functional.
NO: Test bulb. Go to next step.

Continued on next page

KN52281,1004434 -19-02NOV12-13/27

Step 4



LVAL 11639 —UN—02NOV10

A—Headlight Connector, 119B and 119C Wht Wires

Disconnect each light bulb connector. Is battery voltage present at the 119B and 119C Wht wires at the headlights (A)?

YES: Go to next step.

NO: Test F9 fuse. Test light switch. Check 138 Gry wire, 119 Wht, X3 connector, 119A, 119B, and 119C Wht wires and connections.

KN52281,1004434 -19-02NOV12-14/27

Step 5

Is continuity to ground present at the 010B and 010C Blk wires at the headlights (A)?

YES: Connect each light bulb connector. Go to next step.

NO: Check 010B, 010C Blk wires, X3 connector, 010A, and 010P Blk wires and connections.

KN52281,1004434 -19-02NOV12-15/27

Step 6

Is right tail light illuminated?

YES: Right tail light circuit is functional.

NO: Go to next step.

KN52281,1004434 -19-02NOV12-16/27

Step 7

Is left tail light illuminated?

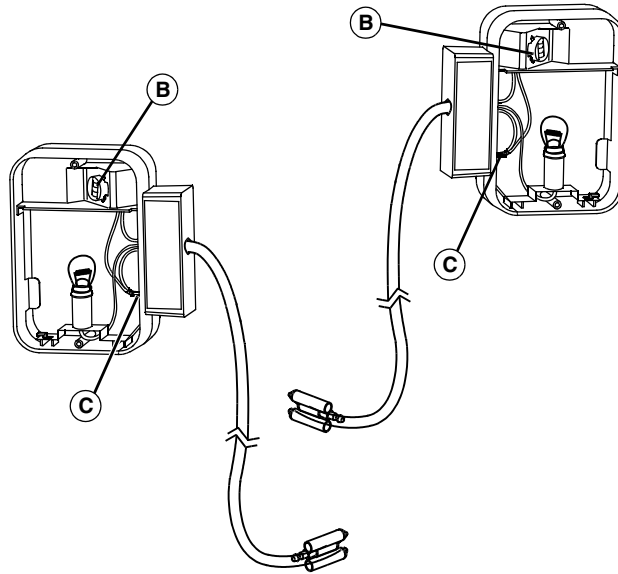
YES: Left tail light circuit is functional.

NO: Go to next step.

KN52281,1004434 -19-02NOV12-17/27

Continued on next page

Step 8



LVAL11640 —UN—02NOV10

B—Turn Lights, 143 and 133 Grn Wires

C—Turn Lights, 010D and 010G Blk Wires

Remove the turn bulb from the side to be tested. Is battery voltage present at the 143 and 133 Grn wires (B)?

YES: Go to next step.

NO: Test F5 fuse. Test light switch. Check 138 Gry wire and connections.

KN52281,1004434 -19-02NOV12-18/27

Step 9

Is continuity to ground present at the 010D and 010G Blk wires at the turn lights (C)?

YES: Install the turn light bulb(s). Go to next step.

NO: Check 010D, 010G, and 010C Blk wires and connections.

KN52281,1004434 -19-02NOV12-19/27

Test Procedure C

Test Conditions:

- Park brake locked.

- Key switch in off position.
- Light switch in field position.
- Power circuits functioning properly. (See [Power Circuit Operation](#) in Section 40, Group 35.)

KN52281,1004434 -19-02NOV12-20/27

Field Lights Circuit

KN52281,1004434 -19-02NOV12-21/27

Step 1

Do the hazard lights flash?

YES: Check for short to hazard lights circuit. Test light switch. (See [Light Circuit Operation](#) in Section 40, Group 35.)

NO: Go to next step.

Continued on next page

KN52281,1004434 -19-02NOV12-22/27

<p>Step 2</p>	<p>Are headlights illuminated?</p>	<p>YES: Headlight circuit is functional.</p> <p>NO: (See Light Circuit Operation in Section 40, Group 35.)</p> <p>KN52281,1004434 -19-02NOV12-23/27</p>
<p>Step 3</p>	<p>Are tail lights illuminated?</p>	<p>YES: Tail light circuit is functional.</p> <p>NO: (See Light Circuit Operation in Section 40, Group 35.)</p> <p>KN52281,1004434 -19-02NOV12-24/27</p>
<p>Step 4</p>	<p>Are all work lights illuminated?</p>	<p>YES: Work lights circuit is functional.</p> <p>NO: Test bulb for each work light that is not illuminated. Go to next step.</p> <p>KN52281,1004434 -19-02NOV12-25/27</p>
<p>Step 5</p>	<div> </div> <p>LVAL11641—UN—02NOV10 A—Work Light, 137 Pur Wire B—Work Light, 010H and 010K Blks Wires Remove the bulb from the work light to be tested. Is battery voltage present at the Pur wire (A)?</p>	<p>YES: Go to next step.</p> <p>NO: Test F8 fuse. Test light switch. Check 137 Pur wire, 147A, 147B, and 147C Pur wires and connections.</p> <p>KN52281,1004434 -19-02NOV12-26/27</p>
<p>Step 6</p>	<p>Is continuity to ground present at the 010H and 010K Blk wires at the work lights (B)?</p>	<p>YES: Install the work light bulb(s). Go to next step.</p> <p>NO: Check 010H, 010K, and 010C Blk wires and connections.</p> <p>KN52281,1004434 -19-02NOV12-27/27</p>

Lights Circuit Diagnosis—MY13

Test Procedure A

NOTE: Test the bulb in each light circuit before beginning the diagnosis steps for the specific circuit.

- Park brake locked.
- Key switch in run position, engine off.
- Light switch in hazard position.
- Check circuit grounds for continuity as tests are performed.

Test Conditions

KN52281,1004435 -19-21JAN13-1/27

Hazard Lights Circuit

KN52281,1004435 -19-21JAN13-2/27

Step 1

Is right amber light flashing?

YES: Right hazard light circuit is functional.

NO: Go to next step.

KN52281,1004435 -19-21JAN13-3/27

Step 2

Is either fault code Err64 or Err65 showing on the display panel?

YES: Fault code Err64—Check 135 Grn wire for short to ground. Check right hazard bulb.

YES: Fault code Err65—Check right hazard bulb. Check 135 Grn wire for short to battery voltage or open circuit.

NO: Go to next step.

KN52281,1004435 -19-21JAN13-4/27

Step 3

Is left amber light flashing?

YES: Left hazard light circuit is functional.

NO: Go to next step.

KN52281,1004435 -19-21JAN13-5/27

Step 4

Is either fault code Err66 or Err67 showing on the display panel?

YES: Fault code Err66—Check 145 Grn wire for short to ground. Check left hazard bulb.

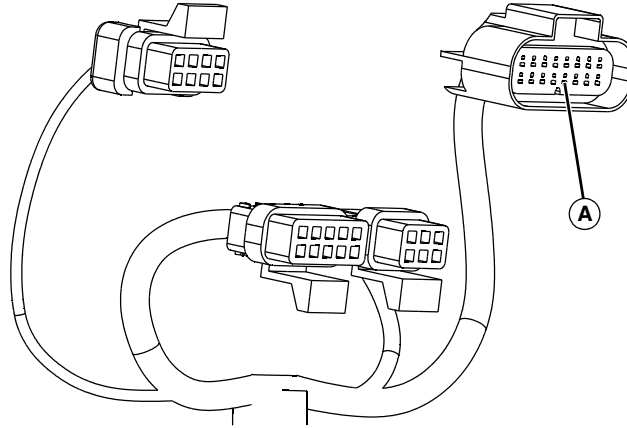
YES: Fault code Err67—Check left hazard bulb. Check 145 Grn wire for short to battery voltage or open circuit.

NO: Go to next step.

Continued on next page

KN52281,1004435 -19-21JAN13-6/27

Step 5



LVAL11637—UN—02NOV10

A—X7 Display Panel Terminal M, 103 Org Wire

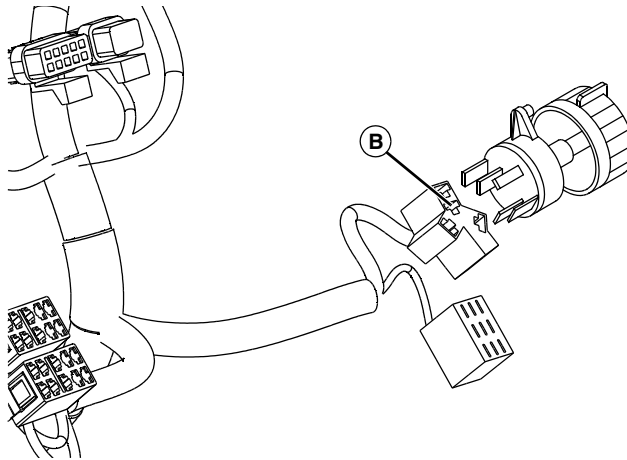
Disconnect X7 connector to the display panel. Is battery voltage present at terminal M, 103 Org wire (A)?

YES: Connect X7 connector. If no output to hazard lights on 135 and 145 Grn wires, replace display panel.

NO: Check 103 Org wire and connections. Test light switch.

KN52281,1004435 -19-21JAN13-7/27

Step 6



LVAL11638—UN—02NOV10

B—S2 Light Switch Connector, 122B Red Wire

Disconnect the light switch. Is battery voltage present at S2 light switch connector 122B Red wire (B)?

YES: Circuit is functional.

NO: Test unswitched power circuit. (See [Power Circuit](#)

[Diagnosis—MY13—NA](#) in Section 40, Group 40.) Connect light switch.

KN52281,1004435 -19-21JAN13-8/27

Test Procedure B

Test Conditions

- Park brake locked.
- Key switch in off position.
- Light switch in road position.

KN52281,1004435 -19-21JAN13-9/27

Road Lights Circuit

Continued on next page

KN52281,1004435 -19-21JAN13-10/27

<p>Step 1</p>	<p>Do the hazard lights flash?</p>	<p>YES: Hazard lights are functional. Go to next step.</p> <p>NO: (See Light Circuit Operation in Section 40, Group 40.)</p> <p>KN52281,1004435 -19-21JAN13-11/27</p>
<p>Step 2</p>	<p>Is right headlight illuminated?</p>	<p>YES: Right headlight circuit is functional.</p> <p>NO: Test bulb. Go to next step.</p> <p>KN52281,1004435 -19-21JAN13-12/27</p>
<p>Step 3</p>	<p>Is left headlight illuminated?</p>	<p>YES: Left headlight circuit is functional.</p> <p>NO: Test bulb. Go to next step.</p> <p>KN52281,1004435 -19-21JAN13-13/27</p>
<p>Step 4</p>	<div> </div> <p>LVAL11639 —JUN—02NOV10 A—Headlight Connector, 119B and 119C Wht Wires Disconnect each light bulb connector. Is battery voltage present at the 119B and 119C Wht wires at the headlights (A)?</p>	<p>YES: Go to next step.</p> <p>NO: Test F9 fuse. Test light switch. Check 138 Gry wire, X3 connector, 119A, 119B, and 119C Wht wires and connections.</p> <p>KN52281,1004435 -19-21JAN13-14/27</p>
<p>Step 5</p>	<p>Is continuity to ground present at the 010B and 010C Blk wires at the headlights (A)?</p>	<p>YES: Connect each light bulb connector. Go to next step.</p> <p>NO: Check 010B, 010C Blk wires, X3 connector, 010A, and 010P Blk wires and connections.</p> <p>KN52281,1004435 -19-21JAN13-15/27</p>

Continued on next page

Step 6

Is right tail light illuminated?

YES: Right tail light circuit is functional.

NO: Go to next step.

KN52281,1004435 -19-21JAN13-16/27

Step 7

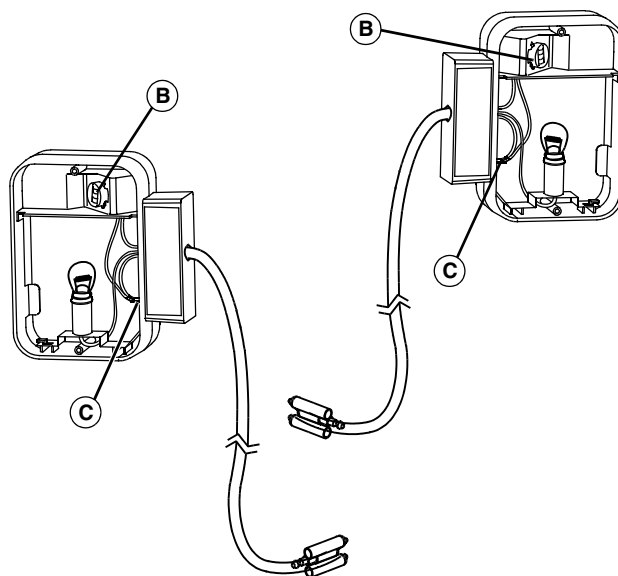
Is left tail light illuminated?

YES: Left tail light circuit is functional.

NO: Go to next step.

KN52281,1004435 -19-21JAN13-17/27

Step 8



LVAL11640 —UN—02NOV10

B—Tail Lights, 119D and 119E Wht Wires

C—Tail Lights, 010D and 010G Blk Wires

Remove the tail bulb from the side to be tested. Is battery voltage present at the 119D and 119E Wht wires (B)?

YES: Go to next step.

NO: Test F5 fuse. Test light switch. Check 138 Gry wire and connections.

KN52281,1004435 -19-21JAN13-18/27

Step 9

Is continuity to ground present at the 010D and 010G Blk wires at the turn lights (C)?

YES: Install the turn light bulb(s). Go to next step.

NO: Check 010D, 010G, and 010C Blk wires and connections.

KN52281,1004435 -19-21JAN13-19/27

Test Procedure C

Test Conditions

- Park brake locked.

- Key switch in off position.
- Light switch in field position.
- Power circuits functioning properly (see Power Circuit Diagnosis—MY13—NA in Section 40, Group 40).

KN52281,1004435 -19-21JAN13-20/27

Field Lights Circuit

Continued on next page

KN52281,1004435 -19-21JAN13-21/27

<p>Step 1</p>	<p>Do the hazard lights flash?</p>	<p>YES: Check for short to hazard lights circuit. Test light switch. (See Light Circuit Operation in Section 40, Group 40.)</p> <p>NO: Go to next step.</p> <p>KN52281,1004435 -19-21JAN13-22/27</p>
<p>Step 2</p>	<p>Are headlights illuminated?</p>	<p>YES: Headlight circuit is functional.</p> <p>NO: (See Light Circuit Operation in Section 40, Group 40.)</p> <p>KN52281,1004435 -19-21JAN13-23/27</p>
<p>Step 3</p>	<p>Are tail lights illuminated?</p>	<p>YES: Tail light circuit is functional.</p> <p>NO: (See Light Circuit Operation in Section 40, Group 40.)</p> <p>KN52281,1004435 -19-21JAN13-24/27</p>
<p>Step 4</p>	<p>Are all work lights illuminated?</p>	<p>YES: Work lights circuit is functional.</p> <p>NO: Test bulb for each work light that is not illuminated. Go to next step.</p> <p>KN52281,1004435 -19-21JAN13-25/27</p>
<p>Step 5</p>	<div> </div> <p>LVAL11641 —UN—02NOV10 A—Work Light, 147 Pur Wire B—Work Light, 010H and 010K Blks Wires Remove the bulb from the work light to be tested. Is battery voltage present at the Pur wire (A)?</p>	<p>YES: Go to next step.</p> <p>NO: Test F8 fuse. Test light switch. Check 137A Pur wire, 147A, 147B, and 147C Pur wires and connections.</p> <p>Continued on next page</p> <p>KN52281,1004435 -19-21JAN13-26/27</p>

Step 6

Is continuity to ground present at the 010H and 010K Blk wires at the work lights (B)?

YES: Install the work light bulb(s). Go to next step.

NO: Check 010H, 010K, and 010C Blk wires and connections.

KN52281,1004435 -19-21JAN13-27/27

Turn Signal Lights Circuit Operation—Pre MY08

Turn Signal Switch Function:

Provides intermittent current to the turn signal lights and hazard lights.

Operating Condition:

- Key switch in the run position,
- and,
- Turn signal switch in the left position, light switch in any position,
- or,
- Turn signal switch in the right position, light switch in any position.

Theory of Operation:

Unswitched power is provided to the turn signal switch through the 122C Red wire and 122A Red wire (terminal 2).

Turn Signal Switch Left Position:

With the turn signal switch in the left position, constant power is provided to the 115 Grn wire and the display panel at the X6 connector terminal E.

From the display panel, intermittent power is provided to the 133 Org and 145 Grn wires. Wire 133 Org provides intermittent power to the left turn signal light while wire 145 Grn provides intermittent power to the left hazard light.

At the same time constant power is provided to the 143 Org and 135 Grn wires. Wire 143 Org provides constant power to the right turn signal light while wire 135 Grn provides constant power to the right hazard light.

Additionally, the turn signal indicator lights on the display panel will be illuminated. The left turn indicator light will flash with the turn signal and hazard light while the right indicator light will illuminate with constant power.

If the intermittent output from the display panel to the turn signal light and the hazard light is faulty for some reason, a fault code will appear on the display panel.

Err62 and Err63 indicate a fault on the left turn signal light.

Err66 and Err67 indicate a fault on the left hazard light.

Err62 (turn signal) and Err66 (hazard) indicate a short to ground. Check the 133 Org and 145 Grn wires for a pinch

to the frame or other ground wire, or corrosion causing a short to the frame or other ground wires.

Err63 (turn signal) and Err67 (hazard) indicate a short to battery voltage or an open circuit on wires 133 Org and 145 Grn. Check for a defective bulb, a broken wire to or from the turn signal light or hazard lights, or wires 133 Org or 145 Grn shorted to a wire with battery voltage present.

The ground path for the left turn signal light and hazard light is provided by 010G and 010C Blk wires.

Turn Signal Switch Right Position:

With the turn signal switch in the right position, constant power is provided to the 125 Grn wire and the display panel at the X6 connector terminal D.

From the display panel, intermittent power is provided to the 143 Org and 135 Grn wires. Wire 143 Org provide intermittent power to the right turn signal light while wire 135 Grn provide intermittent power to the right hazard light.

At the same time constant power is provided to the 133 Org and 145 Grn wires. Wire 133 Org provides constant power to the left turn signal light while wire 145 Grn provides constant power to the left hazard light.

Additionally, the turn signal indicator lights on the display panel will be illuminated. The right turn indicator light will flash with the turn signal and hazard light while the left indicator light will illuminate with constant power.

If the intermittent output from the display panel to the turn signal light and the hazard light is faulty for some reason, a fault code will appear on the display panel.

Err60 and Err61 indicate a fault on the right turn signal light.

Err64 and Err65 indicate a fault on the right hazard light.

Err60 (turn signal) and Err64 (hazard) indicate a short to ground. Check the 143 Org and 135 Grn wires for a pinch to the frame or other ground wire, or corrosion causing a short to the frame or other ground wires.

Err61 (turn signal) and Err65 (hazard) indicate a short to battery voltage or an open circuit on wires 143 Org and 135 Grn. Check for a defective bulb, a broken wire to or from the turn signal light or hazard lights, or wires 143 Org or 135 Grn shorted to a wire with battery voltage present.

The ground path for the right turn signal light and hazard light is provided by 010D, and 010C Blk wires.

KN52281,1004436 -19-02NOV12-1/1

Turn Signal Lights Circuit Operation—MY13

Turn Signal Switch Function

Provides intermittent current to the turn signal lights and hazard lights.

Operating Condition

- Key switch in the run position,
- and,
- Turn signal switch in the left position, light switch in any position,
- or,
- Turn signal switch in the right position, light switch in any position.

Theory of Operation

Switched power is provided to the turn signal switch through the 562P Red wire.

Turn Signal Switch Left Position

With the turn signal switch in the left position, constant power is provided to the 115 Grn wire and the display panel at the X6 connector terminal E.

From the display panel, intermittent power is provided to the 145A Grn wire. Wire 145A Grn provides intermittent power to the left turn/hazard light.

At the same time constant power is provided to the 135A Grn wire. Wire 135A Grn provides constant power to the right turn/hazard light.

Additionally, the turn signal indicator lights on the display panel will be illuminated. The left turn indicator light will flash with the turn signal/hazard light while the right indicator light will illuminate with constant power.

If the intermittent output from the display panel to the turn signal/hazard light is faulty for some reason, a fault code will appear on the display panel.

Err62 and Err63 indicate a fault on the left turn signal light.

Err66 and Err67 indicate a fault on the left hazard light.

Err62 (turn signal) and Err66 (hazard) indicate a short to ground. Check the 145A Grn wire for a pinch to the frame

or other ground wire, or corrosion causing a short to the frame or other ground wires.

Err63 (turn signal) and Err67 (hazard) indicate a short to battery voltage or an open circuit on wires 145A Grn. Check for a defective bulb, a broken wire to or from the turn signal light or hazard lights, or wire 145A Grn shorted to a wire with battery voltage present.

The ground path for the left turn signal/hazard light is provided by 010G and 010C Blk wires.

Turn Signal Switch Right Position

With the turn signal switch in the right position, constant power is provided to the 125 Grn wire and the display panel at the X6 connector terminal D.

From the display panel, intermittent power is provided to the 135A Grn wires. Wire 135A Grn provides intermittent power to the right turn/hazard light.

At the same time constant power is provided to the 145A Grn wire. Wire 145A Grn provides constant power to the left turn/hazard light.

Additionally, the turn signal indicator lights on the display panel will be illuminated. The right turn indicator light will flash with the turn signal and hazard light while the left indicator light will illuminate with constant power.

If the intermittent output from the display panel to the turn signal/hazard light is faulty for some reason, a fault code will appear on the display panel.

Err60 and Err61 indicate a fault on the right turn signal light.

Err64 and Err65 indicate a fault on the right hazard light.

Err60 (turn signal) and Err64 (hazard) indicate a short to ground. Check the 135A Grn wires for a pinch to the frame or other ground wire, or corrosion causing a short to the frame or other ground wires.

Err61 (turn signal) and Err65 (hazard) indicate a short to battery voltage or an open circuit on wire 135A Grn. Check for a defective bulb, a broken wire to or from the turn signal light or hazard lights, or wire 135A Grn shorted to a wire with battery voltage present.

The ground path for the right turn signal light and hazard light is provided by 010D, and 010C Blk wires.

KN52281,1004437 -19-21JAN13-1/1

Turn Signal Lights Circuit Electrical Schematic—Pre MY08

This electrical schematic illustrates the wiring for the turn signal lights on a vehicle, specifically for models prior to MY08. The circuit is powered by a battery (G1) and includes a key switch, a starting motor (M1), and a starting motor solenoid (Y1). The turn signal system is controlled by a turn signal switch (S5) and includes a fuse (F1) and a fusible link (F2). The schematic shows the following components and wiring:

- Battery (G1):** Provides power to the circuit. The positive terminal is connected to a red wire (002C Red) that passes through a fuse (F1) and a fusible link (F2).
- Key Switch:** Controls the main power distribution. It has positions for Off, Aid, Acc., Off, Run, and Start. The Run position is connected to a red wire (072B Red) that passes through a fuse (F7) and a fusible link (F8).
- Starting Motor (M1) and Solenoid (Y1):** The starting motor is connected to the battery through a red wire (002C Red) and a fusible link (F2). The solenoid is connected to the starting motor through a red wire (072C Red) and a fusible link (F9).
- Turn Signal Switch (S5):** Controls the turn signal lights. It has positions for (Right), (Off), and (Left). The (Right) position is connected to a red wire (122D Red) that passes through a fuse (F10) and a fusible link (F11). The (Left) position is connected to a red wire (122E Red) that passes through a fuse (F10) and a fusible link (F11).
- Fuses and Fusible Links:** Fuses F1, F2, F3, F4, F5, F6, F7, F8, F9, F10, and F11 are used to protect the circuit. Fusible links F1 and F2 are used to protect the main power lines.
- Wiring Colors and Labels:** The schematic uses various wire colors and labels to identify the connections. Red wires are used for the main power and turn signal lines. Black wires (050A Blk, 010C Blk) are used for ground connections. Green wires (125 Grn, 115 Grn) are used for the turn signal switch.

The schematic is a detailed representation of the electrical system, showing the flow of current from the battery through the various components and the protection provided by the fuses and fusible links. The use of different wire colors and labels helps to distinguish between the various circuits and components.

TM2138 (23JAN13)

F1— Fusible Link
F3— Fuse 30A
F4— Not Used
F5— Fuse 30A
F6— Not Used

F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A
F10— Not Used
F11— Fuse 10A

G1—Battery
M1—Starting Motor
S1— Key Switch
S5— Turn Signal Switch

W1—Frame Ground
Y1— Starting Motor Solenoid

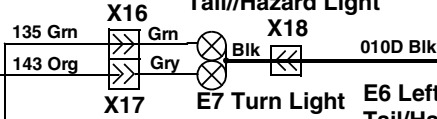
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KN52281,1004438 -19-02NOV12-2/4

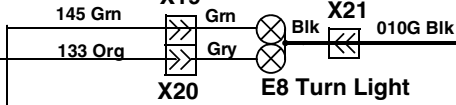
562H Red

562H Red

E5 Right
Tail/Hazard Light



E6 Left
Tail/Hazard Light



145 Gm

135 Gm

122D Red

122E Red

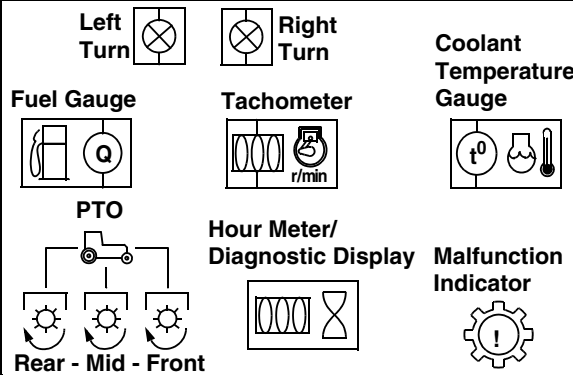
125 Gm

115 Gm

X6

A1 Display Panel

X10

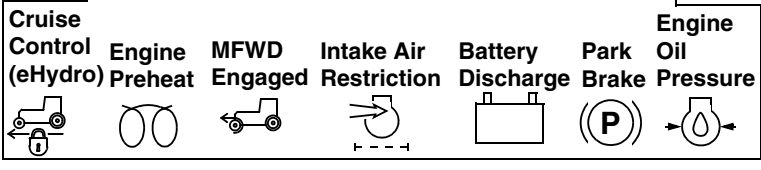


562H Red
519 Wht
353A Org
122E Red
359 Wht
325B Gm
351 Brn
122D Red
347A Pur
586 Blu

X11

135 Gm
145 Gm
594 Yel
050D Blk

X7



050A Blk

010C Blk

050D Blk

010C Blk

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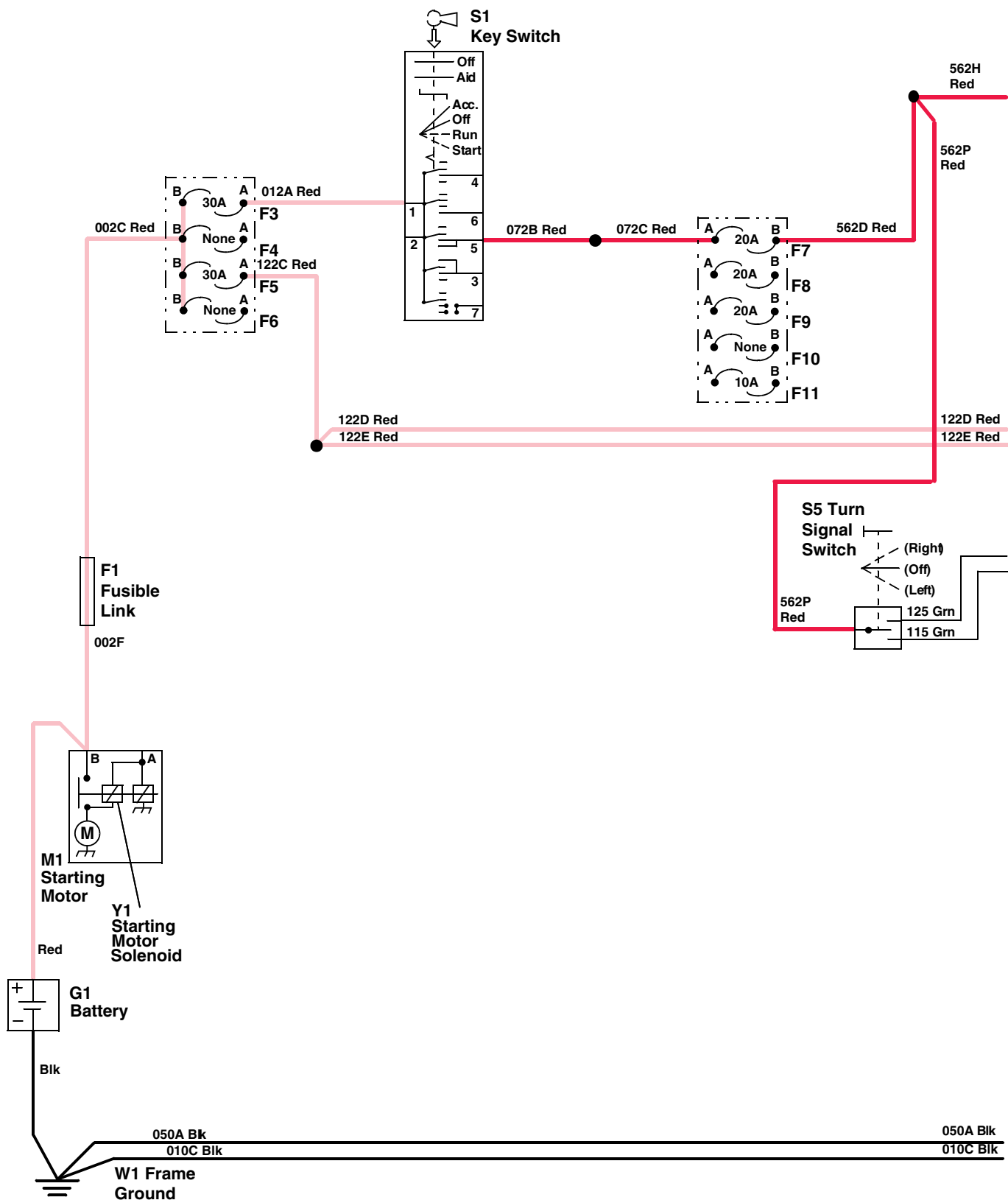
KN52281,1004438 -19-02NOV12-3/4

LVAL11643 —UN—02NOV10

A1—Display Panel	X10— W1 Main Wiring Harness-to-A1 Display Panel	X18— W1 Main Wiring Harness to E5/E7 Right Tail/Turn/Hazard Lights	X21— W1 Main Wiring Harness to E6/E8 Left Tail/Turn/Hazard Lights
E5—Right Tail/Hazard Light			
E6—Left Tail/Hazard Light			
E7—Right Turn Light	X11— W1 Main Wiring Harness-to-A1 Display Panel	X19— W1 Main Wiring Harness to E6 Left Tail/Hazard Light	
E8—Left Turn Light			
X6—W1 Main Wiring Harness-to-A1 Display Panel	X16— W1 Main Wiring Harness to E5 Right Tail/Hazard Light	X20— W1 Main Wiring Harness to E8 Left Turn Light	
X7—W1 Main Wiring Harness-to-A1 Display Panel	X17— W1 Main Wiring Harness to E7 Right Turn Light		

KN52281,1004438 -19-02NOV12-4/4

Turn Signal Lights Circuit Electrical Schematic—MY08



LVAL11644 —UN—02NOV10

Continued on next page

KN52281,1004439 -19-02NOV12-1/4

Operation and Diagnostics

F1— Fusible Link
F3— Fuse 30A
F4— Not Used
F5— Fuse 30A
F6— Not Used

F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A
F10— Not Used
F11— Fuse 10A

G1—Battery
M1—Starting Motor
S1— Key Switch
S5— Turn Signal Switch

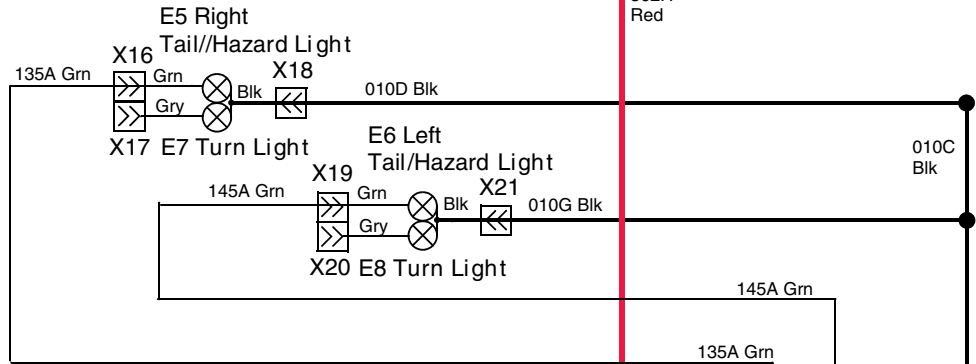
W1—Frame Ground
Y1— Starting Motor Solenoid

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KN52281,1004439 -19-02NOV12-2/4

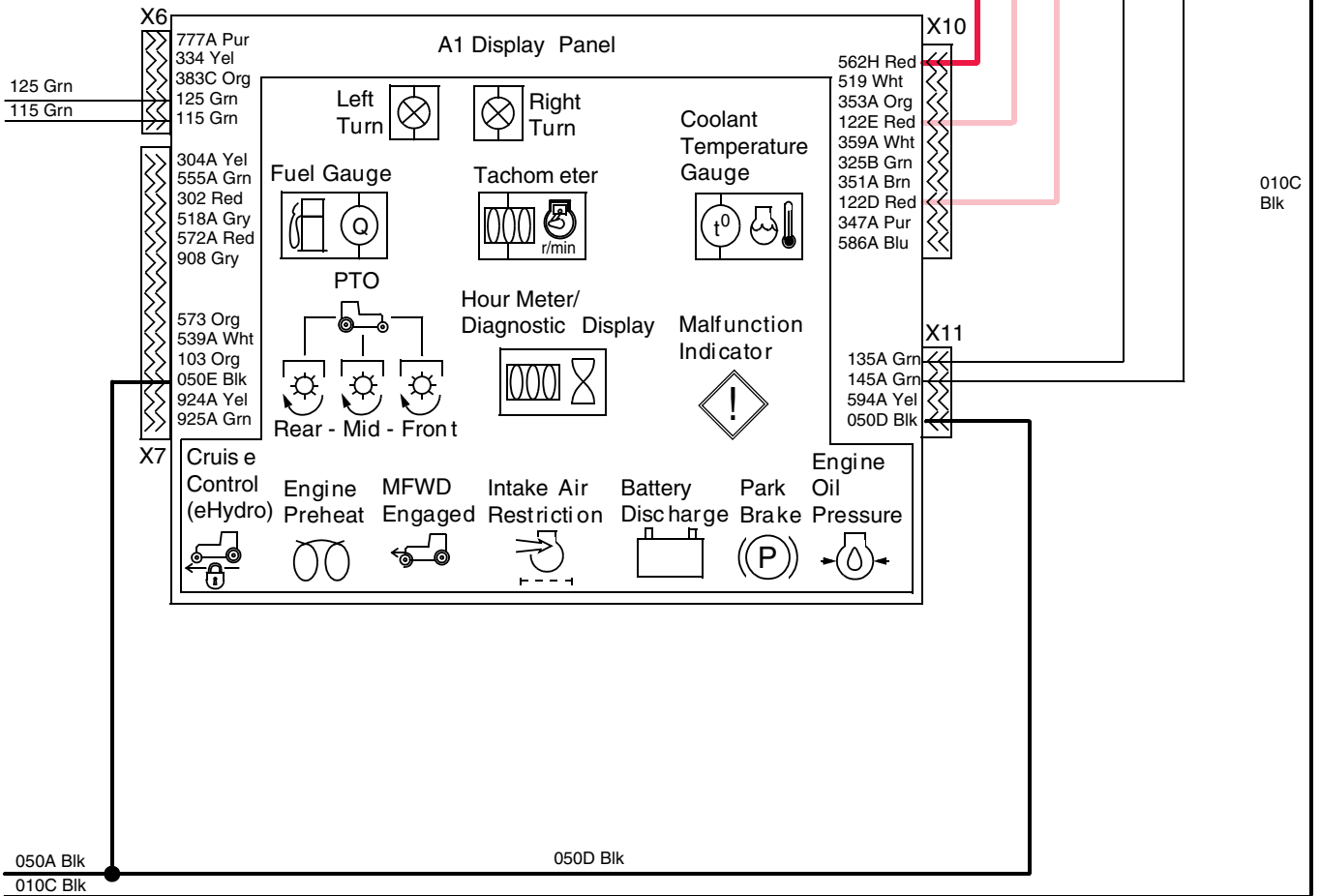
562H Red

562H Red



122D Red

122E Red



LVAL11645—UN—02NOV10

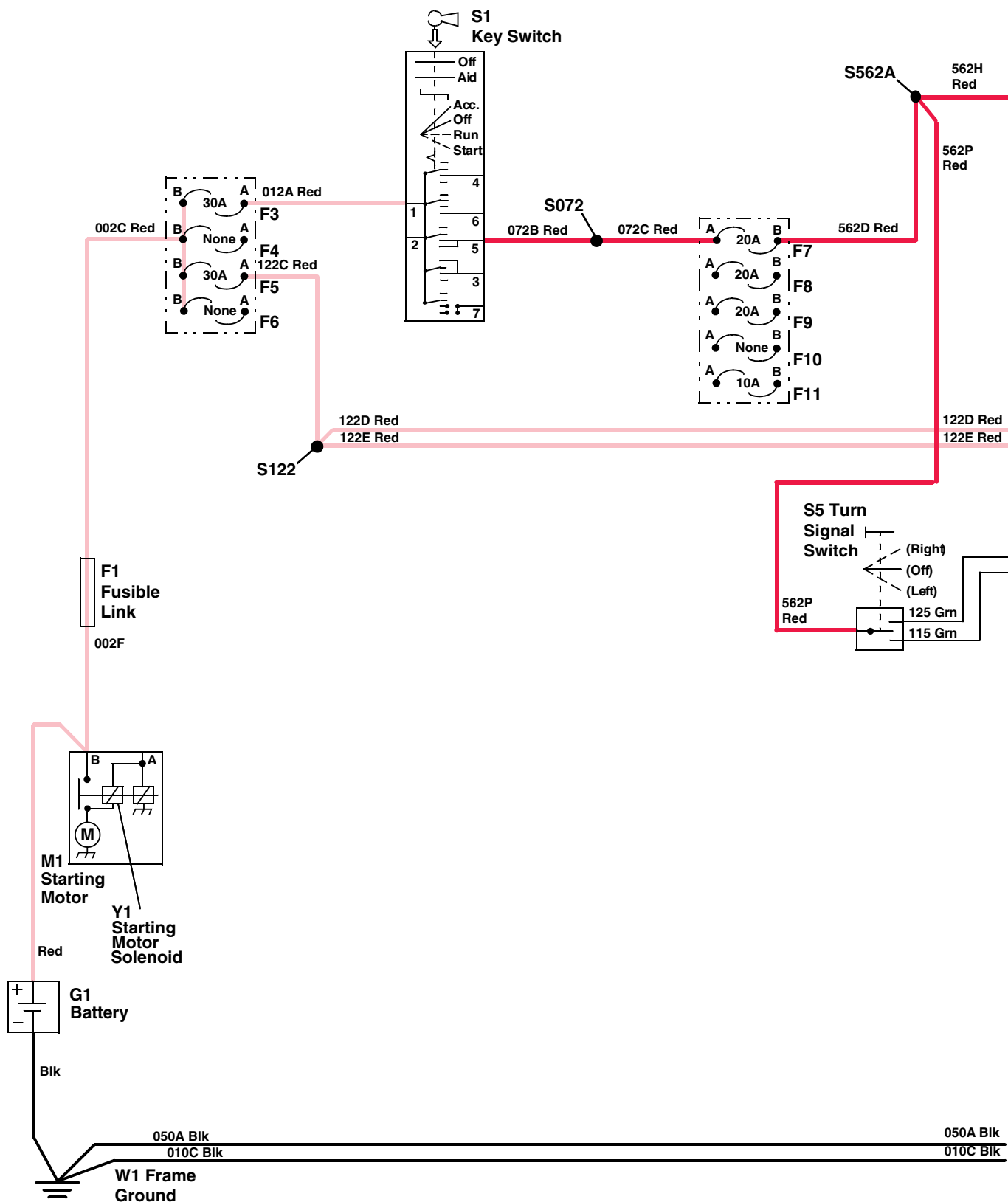
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KN52281,1004439 -19-02NOV12-3/4

A1—Display Panel	X10— W1 Main Wiring Harness-to-A1 Display Panel	X18— W1 Main Wiring Harness to E5/E7 Right Tail/Turn/Hazard Lights	X21— W1 Main Wiring Harness to E6/E8 Left Tail/Turn/Hazard Lights
E5—Right Hazard Light			
E6—Left Hazard Light			
E7—Right Turn Light	X11— W1 Main Wiring Harness-to-A1 Display Panel	X19— W1 Main Wiring Harness to E6 Left Tail/Hazard Light	
E8—Left Turn Light			
X6—W1 Main Wiring Harness-to-A1 Display Panel	X16— W1 Main Wiring Harness to E5 Right Tail/Hazard Light	X20— W1 Main Wiring Harness to E8 Left Turn Light	
X7—W1 Main Wiring Harness-to-A1 Display Panel	X17— W1 Main Wiring Harness to E7 Right Turn Light		

KN52281,1004439 -19-02NOV12-4/4

Turn Signal Lights Circuit Electrical Schematic—MY13



LVAL38732 —UN—16OCT12

Continued on next page

KN52281,100443A -19-10DEC12-1/4

Operation and Diagnostics

F1— Fusible Link
F3— Fuse 30A
F4— Not Used
F5— Fuse 30A
F6— Not Used

F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A
F10— Not Used
F11— Fuse 10A

G1—Battery
M1—Starting Motor
S1— Key Switch
S5— Turn Signal Switch

W1—Frame Ground
Y1— Starting Motor Solenoid

Continued on next page

KN52281,100443A -19-10DEC12-2/4

562H Red

562H Red

S010B

010C Blk

145A Grn

135A Grn

122D Red

122E Red

010C Blk

X6

125 Grn

115 Grn

A1 Display Panel

X10

562H Red
519 Wht
353A Org
122E Red
359A Wht
565A Dk Grn
351A Brn
122D Red
347A Pur
586A Blu

X11

135A Grn
145A Grn
594A Yel

050D Blk

X7

050A Blk

010C Blk

S050A

050D Blk

LVAL38733 —UN—05DEC12

Continued on next page

KN52281,100443A -19-10DEC12-3/4

A1—Display Panel	X10— W1 Main Wiring Harness-to-A1 Display Panel	X18— W1 Main Wiring Harness to E5/E7 Right Tail/Turn/Hazard Lights	X21— W1 Main Wiring Harness to E6/E8 Left Tail/Turn/Hazard Lights
E5—Right Hazard Light	X11— W1 Main Wiring Harness-to-A1 Display Panel	X19— W1 Main Wiring Harness to E6 Left Tail/Hazard Light	
E6—Left Hazard Light		X20— W1 Main Wiring Harness to E8 Left Turn Light	
E7—Right Turn Light			
E8—Left Turn Light			
X6—W1 Main Wiring Harness-to-A1 Display Panel	X16— W1 Main Wiring Harness to E5 Right Tail/Hazard Light		
X7—W1 Main Wiring Harness-to-A1 Display Panel	X17— W1 Main Wiring Harness to E7 Right Turn Light		

KN52281,100443A -19-10DEC12-4/4

Turn Signal Lights Circuit Diagnosis—Pre MY08

Test Procedure A

Test Conditions:

- Key switch in run position, engine off.
- Light switch in off position.
- Turn signal switch in left position.

KN52281,100443B -19-02NOV12-1/20

Left Turn Signal Lights Circuit

KN52281,100443B -19-02NOV12-2/20

Step 1

Is left red light flashing?

YES: Left turn signal light circuit is functional.

NO: Go to next step.

KN52281,100443B -19-02NOV12-3/20

Step 2

Is either fault code Err62 or Err63 showing on the display panel?

YES: Fault code Err62—Check 133 Org wire for short to ground. Check left turn signal bulb.

YES: Fault code Err63—Check left turn signal bulb. Check 133 Org wire for short to battery voltage or open circuit.

NO: Go to next step.

KN52281,100443B -19-02NOV12-4/20

Step 3

Is left amber light flashing?

YES: Left hazard light circuit is functional.

NO: Go to next step.

KN52281,100443B -19-02NOV12-5/20

Step 4

Is either fault code Err66 or Err67 showing on the display panel?

YES: Fault code Err66—Check 145 Grn wire for short to ground. Check left hazard bulb.

YES: Fault code Err67—Check left hazard bulb. Check 145 Grn wire for short to battery voltage or open circuit.

NO: Go to next step.

Continued on next page

KN52281,100443B -19-02NOV12-6/20

Step 5

Is right red light illuminated, constant on?

YES: Right turn light circuit is functional.
NO: Check 143 Org wire and connections. Go to next step.

KN52281,100443B -19-02NOV12-7/20

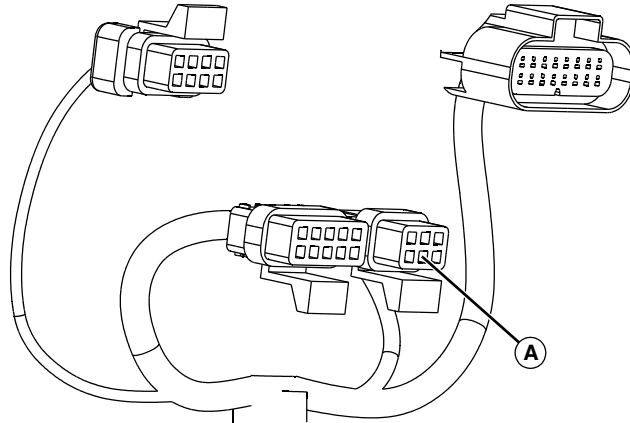
Step 6

Is right amber light illuminated, constant on?

YES: Right hazard light circuit is functional.
NO: Check 135 Grn wire and connections. Go to next step.

KN52281,100443B -19-02NOV12-8/20

Step 7



LVAL11646 —UN—02NOV10

A—X6 Display Panel Terminal E, 115 Grn Wire

Disconnect X6 connector to the display panel. Is battery voltage present at terminal E, 115 Grn wire (A)?

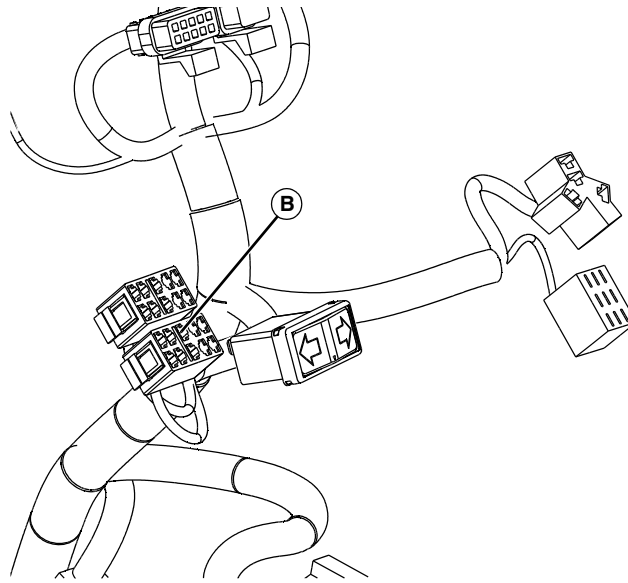
YES: Connect X6 connector. If no output to turn signal light or hazard light on 133 Org and 145 Grn wires, replace display panel.

NO: Check 115 Grn wire and connections. Test turn signal switch.

Continued on next page

KN52281,100443B -19-02NOV12-9/20

Step 8



LVAL1164Z—UN—02NOV10

B—S5 Turn Signal Switch, 122A Red Wire

Disconnect the turn signal switch. Is battery voltage present at S5 turn signal switch connector 122A Red wire (B)?

YES: Circuit is functional.

NO: Test unswitched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

KN52281,100443B -19-02NOV12-10/20

Test Procedure B

Test Conditions:

- Key switch in run position, engine off.

- Light switch in off position.
- Turn signal switch in right position.

KN52281,100443B -19-02NOV12-11/20

Right Turn Signal Lights Circuit

KN52281,100443B -19-02NOV12-12/20

Step 1

Is right red light flashing?

YES: Right turn signal light circuit is functional.

NO: Go to next step.

KN52281,100443B -19-02NOV12-13/20

Step 2

Is either fault code Err60 or Err61 showing on the display panel?

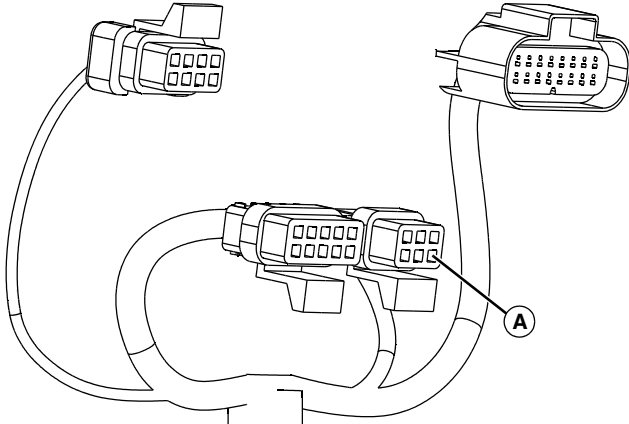
YES: Fault code Err60—Check 143 Org wire for short to ground. Check right turn signal bulb.

YES: Fault code Err61—Check right turn signal bulb. Check 143 Org wire for short to battery voltage or open circuit.

NO: Go to next step.

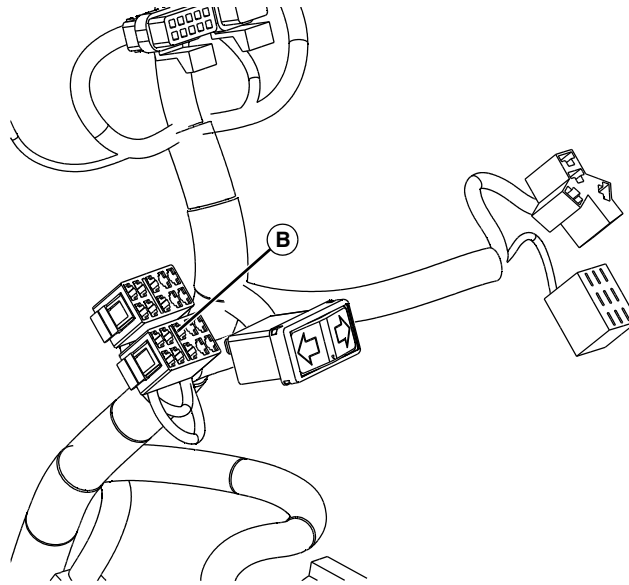
Continued on next page

KN52281,100443B -19-02NOV12-14/20

Step 3	Is right amber light flashing?	<p>YES: Right hazard light circuit is functional.</p> <p>NO: Go to next step.</p> <p>KN52281,100443B -19-02NOV12-15/20</p>
Step 4	Is either fault code Err64 or Err65 showing on the display panel?	<p>YES: Fault code Err64—Check 135 Grn wire for short to ground. Check right hazard bulb.</p> <p>YES: Fault code Err65—Check right hazard bulb. Check 135 Grn wire for short to battery voltage or open circuit.</p> <p>NO: Go to next step.</p> <p>KN52281,100443B -19-02NOV12-16/20</p>
Step 5	Is left red light illuminated, constant on?	<p>YES: Left turn light circuit is functional.</p> <p>NO: Check 133 Org wire and connections. Go to next step.</p> <p>KN52281,100443B -19-02NOV12-17/20</p>
Step 6	Is left amber light illuminated, constant on?	<p>YES: Left hazard light circuit is functional.</p> <p>NO: Check 145 Grn wire and connections. Go to next step.</p> <p>KN52281,100443B -19-02NOV12-18/20</p>
Step 7	 <p>LVAL 11648 —UN—02NOV10 A—X6 Display Panel Connector Terminal D, 125 Grn Wire Disconnect X6 connector to the display panel. Is battery voltage present at terminal D, 125 Grn wire (A)?</p>	<p>YES: Connect X6 connector. If no output to turn signal light or hazard light on 143 Org and 135 Grn wires, replace display panel.</p> <p>NO: Check 125 Grn wire and connections. Test turn signal switch.</p> <p>KN52281,100443B -19-02NOV12-19/20</p>

Continued on next page

Step 8



LVAL11649—UN—02NOV10

B—S5 Turn Signal Switch, 122A Red Wire

Disconnect the turn signal switch. Is battery voltage present at S5 turn signal switch connector 122A Red wire (B)?

YES: Circuit is functional.

NO: Test unswitched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

KN52281,100443B -19-02NOV12-20/20

Turn Signal Lights Circuit Diagnosis—MY13

Test Procedure A

Test Conditions

- Key switch in run position, engine off.
- Light switch in off position.
- Turn signal switch in left position.

KN52281,100443C -19-21JAN13-1/14

Left Turn Signal Lights Circuit

KN52281,100443C -19-21JAN13-2/14

Step 1

Is left red/amber light flashing?

YES: Left turn signal/hazard light circuit is functional.

NO: Go to next step.

KN52281,100443C -19-21JAN13-3/14

Step 2

Is either fault code Err62, Err63 or Err66, Err67 showing on the display panel?

YES: Fault code Err62 or Err66—Check 145A Grn wire for short to ground. Check left turn signal bulb.

YES: Fault code Err63 or Err67—Check left turn signal bulb. Check 145A Grn wire for short to battery voltage or open circuit.

NO: Go to next step.

Continued on next page

KN52281,100443C -19-21JAN13-4/14

Step 3

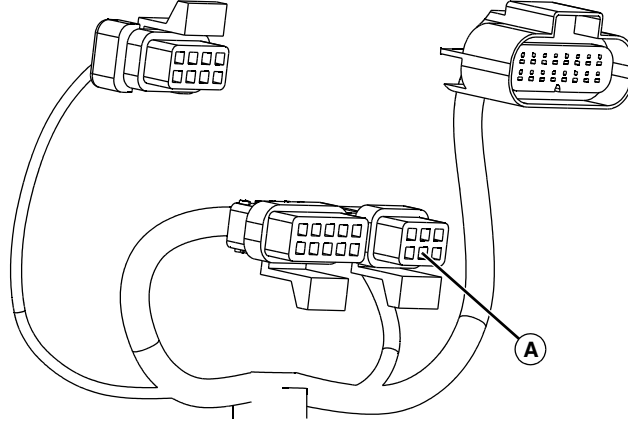
Is right red/amber light illuminated, constant on?

YES: Right turn/hazard light circuit is functional.

NO: Check 135A Grn wire and connections. Go to next step.

KN52281,100443C -19-21JAN13-5/14

Step 4



LVAL11646 —UN—02NOV10

A—X6 Display Panel Terminal E, 115 Grn Wire

Disconnect X6 connector to the display panel. Is battery voltage present at terminal E, 115 Grn wire (A)?

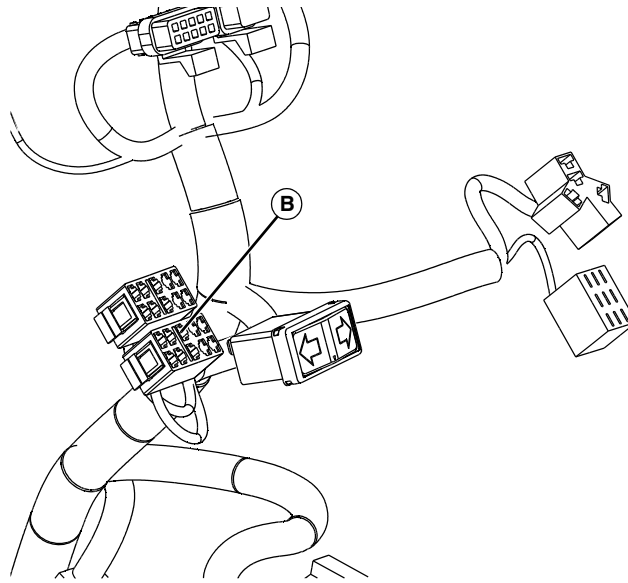
YES: Connect X6 connector. If no output to turn signal/hazard light on 145A Grn wires, replace display panel.

NO: Check 115 Grn wire and connections. Test turn signal switch.

Continued on next page

KN52281,100443C -19-21JAN13-6/14

Step 5



LVAL1164Z—UN—02NOV10

B—S5 Turn Signal Switch, 122B Red Wire

Disconnect the turn signal switch. Is battery voltage present at S5 turn signal switch connector 122B Red wire (B)?

YES: Circuit is functional.

NO: Test unswitched power circuit. (See [Power Circuit Diagnosis—MY13—NA](#) in Section 40, Group 40.)

KN52281,100443C -19-21JAN13-7/14

Test Procedure B

Test Conditions

- Key switch in run position, engine off.

- Light switch in off position.
- Turn signal switch in right position.

KN52281,100443C -19-21JAN13-8/14

Right Turn Signal Lights Circuit

KN52281,100443C -19-21JAN13-9/14

Step 1

Is right red/amber light flashing?

YES: Right turn signal/hazard light circuit is functional.

NO: Go to next step.

KN52281,100443C -19-21JAN13-10/14

Step 2

Is either fault code Err60, Err61 or Err64,Err65 showing on the display panel?

YES: Fault code Err60 or Err64—Check 135A Grn wire for short to ground. Check right turn signal bulb.

YES: Fault code Err61 or Err65—Check right turn signal bulb. Check 135A Grn wire for short to battery voltage or open circuit.

NO: Go to next step.

Continued on next page

KN52281,100443C -19-21JAN13-11/14

Step 3

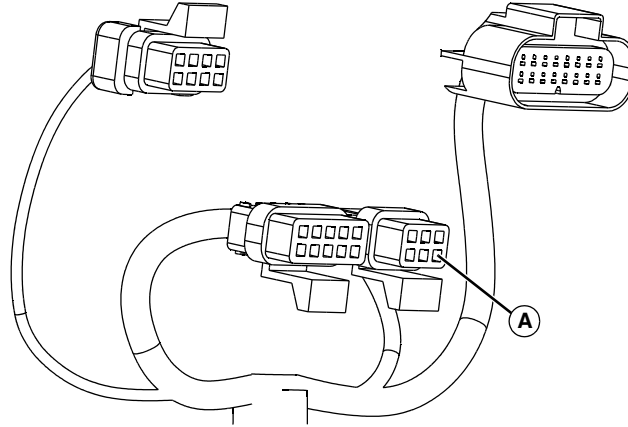
Is left red/amber light illuminated, constant on?

YES: Left turn light circuit is functional.

NO: Check 145A Grn wire and connections. Go to next step.

KN52281,100443C -19-21JAN13-12/14

Step 4



LVAL11648 —UN—02NOV10

A—X6 Display Panel Connector Terminal D, 125 Grn Wire

Disconnect X6 connector to the display panel. Is battery voltage present at terminal D, 125 Grn wire (A)?

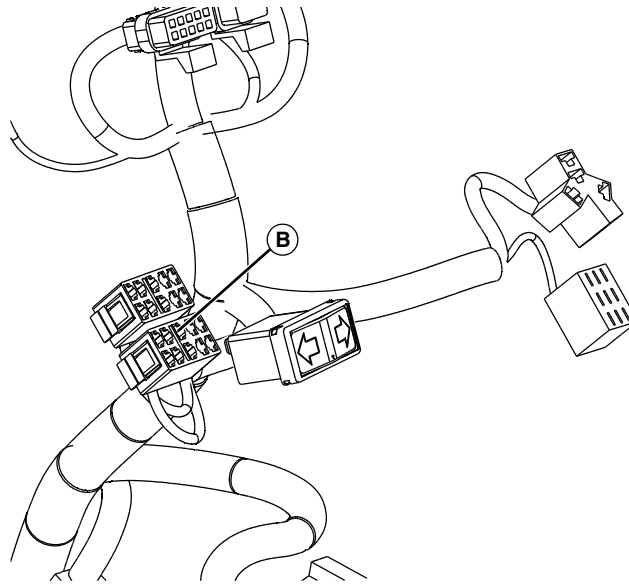
YES: Connect X6 connector. If no output to turn signal/hazard light on 135A Grn wire, replace display panel.

NO: Check 125 Grn wire and connections. Test turn signal switch.

Continued on next page

KN52281,100443C -19-21JAN13-13/14

Step 5



I VAL 11649 —UN— 02NOV10

B—S5 Turn Signal Switch, 122B Red Wire

Disconnect the turn signal switch. Is battery voltage present at S5 turn signal switch connector 122B Red wire (B)?

YES: Circuit is functional.

NO: Test unswitched power circuit. (See [Power Circuit Diagnosis—MY13—NA](#) in Section 40, Group 40.)

KN52281,100443C -19-21JAN13-14/14

Display Panel Operation—Pre MY08

Function:

To display operational information to the operator as to various circuit conditions, example; turn signal on, or PTO on, or fuel level, or diagnostic fault codes.

To perform logic safety interlock to control safe starting, operation and shutoff of the machine engine.

Operating Conditions:

- Key switch in run or start position

Theory of Operation:

The display panel is an electronic circuit board which performs various logic functions based upon input and output signals as well as being a display for the various instruments and indicator lights.

The only functions that do not provide an input to, or receive an output from the display panel, are the headlights, work lights, and fuel pump circuits. All other electrical functions connect to the display panel for some part of their operation.

The display panel receives unswitched voltage at the X10 connector terminal D, 122E Red wire, and H, 122D Red wire, and switched voltage at terminal A, 562H Red. This provides the voltage to power up and operate the display panel.

The display panel has a permanent ground circuit through the X7 connector 050E Blk wire, and X11 connector 050D Blk wires. The 050E and 050D Blk wires splice the 050A Blk wire to frame ground.

The display panel operates with an IF—THEN logic where combinations of voltage inputs (IF's) to the display panel produce combinations of output voltages and/or ground path(s) (THEN's).

Example:

IF voltage is provided to the display panel by the key switch being in the run position, and IF the operator is on the seat;

or,

IF voltage is provided to the display panel by the key switch being in the run position, and IF the operator is off the seat, and IF the park brake is locked, and IF the transmission is in neutral (PRT);

THEN voltage is supplied to the fuel shutoff solenoid relay and fuel shutoff solenoid hold-in coil providing the requirements to keep the machine engine running.

The fuel shutoff solenoid is held in the energized state by voltage provided from the display panel. The fuel relay is initially energized, closing its contacts and providing voltage to the fuel shutoff solenoid pull-in coil. After a short delay, the display panel energizes the fuel shutoff solenoid hold-in coil circuit.

The display panel contains a 0.5 second delay timer, controlling the voltage to the fuel relay. The timer is activated if the operator rises off the seat. 0.5 seconds after the operator leaves the seat, voltage to the fuel solenoid will stop, de-energizing it, closing the fuel shutoff solenoid valve and stopping the engine.

Inputs:

The display panel has 4 connectors (X6, X7, X10, and X11) connecting 33 wires to the display panel to provide the inputs, outputs, and ground.

NOTE: The results listed for each input and output are based upon the operating conditions for that circuit being met. See the individual circuit operation for specific diagnostic procedures.

X6 Connector:

- X6 terminal F (777 Pur)—voltage in from the S11 rear PTO switch (switch on) turns on the PTO light(s). (See [Rear and Mid PTO Circuit Operation](#) in Section 40, Group 35.)
- X6 terminal A (334 Yel)—voltage in from the alternator (alternator running) will turn the battery indicator light off.
- X6 terminal C (385A Grn)—voltage in from the aid position of the key switch (manifold heater circuit) will turn the engine preheat light on.
- X6 terminal D (125 Grn)—voltage in from the turn signal switch (right turn) will turn the right turn indicator light on and start the logic to provide an output to the right turn signal light circuit.
- X6 terminal D (115 Grn)—voltage in from the turn signal switch (left turn) will turn the left turn indicator light on and start the logic to provide an output to the left turn signal light circuit.

X7 Connector:

- X7 terminal A (555 Grn)—voltage in from the MFWD engagement sensing switch (MFWD engaged) will turn the MFWD indicator light on.
- X7 terminal D (572A Red)—voltage in from the start position of the key switch (cranking circuit) will start the logic to provide an output to the start relay if operating conditions are met.
- X7 terminal G (908 Gry)—voltage in from the display mode switch. (See [Display Mode Switch Circuit Operation](#) in Section 40, Group 35.)
- X7 terminal K (573 Org)—voltage in from the rear PTO switch (PTO off) will provide input to fuel, starting, and off seat logic as well as illuminate the rear PTO indicator light when voltage is removed.
- X7 terminal L (539A Wht)—voltage in from the seat switch (operator on seat) will provide input to fuel, starting, and off seat logic.
- X7 terminal M (103 Org)—voltage in from the headlight switch (hazard position) will turn the right and left turn indicator lights on and start the logic to provide an output to the right and left hazard lights circuit.

X10 Connector:

Continued on next page

KN52281,100443D -19-02NOV12-1/2

- X10 terminal A (562H Red)—voltage in from the switched power circuit (key switch in run position) turns on the display panel.
- X10 terminal B (519 Wht)—voltage in from the transmission neutral switch (transmission in neutral) (eHydro™ uses a jumper in place of the transmission neutral switch) will provide input to fuel, starting, and off seat logic.
- X10 terminal C (353 Org)—resistance in (approximately 9 ohms full to 89 ohms empty) from the fuel level sensor will complete the circuit for the fuel gauge to indicate the approximate fuel level within the fuel tank. This will also cause display panel logic to display a low fuel message on the LCD display when the fuel level is near empty (approximately 90 ohms or greater).
- X10 terminal D (122E Red)—voltage in from the battery for one of two operating power supplies.
- X10 terminal E (359 Wht)—resistance in (approximately 22 ohms full hot to 520 ohms full cold) from the engine coolant temperature sensor will complete the circuit for the coolant temperature gauge to indicate the approximate engine coolant temperature.
- X10 terminal F (325B Grn)—frequency in from the alternator (alternator running) will provide input to the tachometer and hour meter as well as the fuel, starting, and off seat logic.
- X10 terminal G (351 Brn)—voltage in from the air filter restriction switch (filter clogged) will turn the intake air restriction indicator light on.
- X10 terminal H (122D Red)—voltage in from the battery for one of two operating power supplies.
- X10 terminal J (347 Pur)—ground in from the engine oil pressure switch (oil pressure less than 40 kPa (5.8 psi)) will turn the engine oil pressure indicator light on.
- X10 terminal K (586 Blu)—voltage in from the park brake switch (park brake locked) will provide input to fuel, starting, and off seat logic as well as illuminate the park brake indicator light.

X11 Connector:

- X11 terminal D (594 Yel)—voltage in from the switched power circuit (key switch in run position). If the mid PTO is installed, this input is also controlled through the mid PTO switch (PTO off) will provide input to fuel, starting, and off seat logic as well as illuminate the mid PTO indicator light when voltage is removed.

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Outputs:

NOTE: The outputs are also monitored by the display panel circuit logic to check circuit operation. If the circuit is not operating properly, the display panel will display a fault code on the LCD display.

X7 Connector:

- X7 terminal N (304 Yel)—voltage out to the fuel relay coil when operating conditions are met.
- X7 terminal B (302 Red)—voltage out to the fuel shutoff solenoid hold-in coil when conditions are met.
- X7 terminal C (518 Gry)—voltage out to the start relay coil when operating conditions are met.
- X7 terminal H (143 Org)—voltage out to the right turn signal light, either pulsing or constant, based on inputs.
- X7 terminal J (133 Org)—voltage out to the left turn signal light, either pulsing or constant, based on inputs.

X11 Connector:

- X11 terminal B (135 Grn)—voltage out to the right hazard light, either pulsing or constant based on inputs.
- X11 terminal C (145 Grn)—voltage out to the left hazard light, either pulsing or constant based on inputs.

Grounds:

X7 Connector:

- X7 terminal P (050E Blk)—provides one of two permanent ground circuits for the display panel.

X11 Connector:

- X11 terminal H (050D Blk)—provides one of two permanent ground circuits for the display panel.

eHydro™/Auto HST Communication:

X7 Connector:

- X7 terminal R (924 Yel)—provides input communication to the display panel from the electronic drive controller.
- X7 terminal S (925 Grn)—provides output communication from the display panel to the electronic drive controller.

KN52281,100443D -19-02NOV12-2/2

Display Panel Operation—MY08

Function:

To display operational information to the operator as to various circuit conditions, example; turn signal on, or PTO on, or fuel level, or diagnostic fault codes.

To perform logic safety interlock to control safe starting, operation and shutoff of the machine engine.

Operating Conditions:

- Key switch in run or start position

Theory of Operation:

The display panel is an electronic circuit board which performs various logic functions based upon input and output signals as well as being a display for the various instruments and indicator lights.

The only functions that do not provide an input to, or receive an output from the display panel, are the headlights, work lights, tail lights, manifold heater, and fuel pump circuits. All other electrical functions connect to the display panel for some part of their operation.

The display panel receives unswitched voltage at the X10 connector terminal D, 122E Red wire, and H, 122D Red wire, and switched voltage at terminal A, 562H Red. This provides the voltage to power up and operate the display panel.

The display panel has a permanent ground circuit through the X7 connector 050E Blk wire, and X11 connector 050D Blk wires. The 050E and 050D Blk wires splice the 050A Blk wire to frame ground.

The display panel operates with an IF—THEN logic where combinations of voltage inputs (IF's) to the display panel produce combinations of output voltages and/or ground path(s) (THEN's).

Example:

IF voltage is provided to the display panel by the key switch being in the run position, and IF the operator is on the seat;

or,

IF voltage is provided to the display panel by the key switch being in the run position, and IF the operator is off the seat, and IF the park brake is locked, and IF the transmission is in neutral (PRT);

THEN voltage is supplied to the fuel shutoff solenoid relay and fuel shutoff solenoid hold-in coil providing the requirements to keep the machine engine running.

The fuel shutoff solenoid is held in the energized state by voltage provided from the display panel. The fuel relay is initially energized, closing its contacts and providing voltage to the fuel shutoff solenoid pull-in coil. After a short delay, the display panel energizes the fuel shutoff solenoid hold-in coil circuit.

The display panel contains a 0.5 second delay timer, controlling the voltage to the fuel relay. The timer is activated if the operator rises off the seat. 0.5 seconds after the operator leaves the seat, voltage to the fuel solenoid will stop, de-energizing it, closing the fuel shutoff solenoid valve and stopping the engine.

Inputs:

The display panel has 4 connectors (X6, X7, X10, and X11) connecting 31 wires to the display panel to provide the inputs, outputs, and grounds.

NOTE: The results listed for each input and output, are based upon the operating conditions for that circuit being met. See the individual circuit operation for specific diagnostic procedures.

X6 Connector:

- X6 terminal F (777A Pur)—voltage in from the S11 rear PTO switch (switch on) will turn the PTO light(s) on. (See Rear and Mid PTO Circuit Operation in Section 40, Group 35.)
- X6 terminal A (334A Yel)—voltage in from the alternator (alternator running) will turn the battery indicator light off.
- X6 terminal D (125 Grn)—voltage in from the turn signal switch (right turn) will turn the right turn indicator light on and start the logic to provide an output to the right turn signal light circuit.
- X6 terminal D (115 Grn)—voltage in from the turn signal switch (left turn) will turn the left turn indicator light on and start the logic to provide an output to the left turn signal light circuit.

X7 Connector:

- X7 terminal A (555A Grn)—voltage in from the MFWD engagement sensing switch (MFWD engaged) will turn the MFWD indicator light on.
- X7 terminal D (572A Red)—voltage in from the start position of the key switch (cranking circuit) will start the logic to provide an output to the start relay if operating conditions are met.
- X7 terminal G (908 Gry)—voltage in from the display mode switch. (See Display Mode Switch Circuit Operation in Section 40, Group 35.)
- X7 terminal K (573 Org)—voltage in from the rear PTO switch (PTO off) will provide input to fuel, starting, and off seat logic as well as illuminate the rear PTO indicator light when voltage is removed.
- X7 terminal L (539A Wht)—voltage in from the seat switch (operator on seat) will provide input to fuel, starting, and off seat logic.
- X7 terminal M (103 Org)—voltage in from the headlight switch (hazard position) will turn the right and left turn indicator lights on and start the logic to provide an output to the right and left hazard lights circuit.

X10 Connector:

- X10 terminal A (562H Red)—voltage in from the switched power circuit (key switch in run position) turns on the display panel.

Continued on next page

KN52281,100443E -19-02NOV12-1/2

- X10 terminal B (519 Wht)—voltage in from the transmission neutral switch (transmission in neutral) (eHydro™ uses a jumper in place of the transmission neutral switch) will provide input to fuel, starting, and off seat logic.
- X10 terminal C (353A Org)—resistance in (approximately 9 ohms full to 89 ohms empty) from the fuel level sensor will complete the circuit for the fuel gauge to indicate the approximate fuel level within the fuel tank. This will also cause display panel logic to display a low fuel message on the LCD display when the fuel level is near empty (approximately 90 ohms or greater).
- X10 terminal D (122E Red)—voltage in from the battery for one of two operating power supplies.
- X10 terminal E (359A Wht)—resistance in (approximately 22 ohms full hot to 520 ohms full cold) from the engine coolant temperature sensor will complete the circuit for the coolant temperature gauge to indicate the approximate engine coolant temperature.
- X10 terminal F (325B Grn)—frequency in from the alternator (alternator running) will provide input to the tachometer and hour meter as well as the fuel, starting, and off seat logic.
- X10 terminal G (351A Brn)—voltage in from the air filter restriction switch (filter clogged) will turn the intake air restriction indicator light on.
- X10 terminal H (122D Red)—voltage in from the battery for one of two operating power supplies.
- X10 terminal J (347A Pur)—ground in from the engine oil pressure switch (oil pressure less than 40 kPa (5.8 psi)) will turn the engine oil pressure indicator light on.
- X10 terminal K (586A Blu)—voltage in from the park brake switch (park brake locked) will provide input to fuel, starting, and off seat logic as well as illuminate the park brake indicator light.

X11 Connector:

- X11 terminal D (594A Yel)—voltage in from the switched power circuit (key switch in run position). If the mid PTO is installed, this input is also controlled through the mid PTO switch (PTO off) will provide input to fuel, starting, and off seat logic as well as illuminate the mid PTO indicator light when voltage is removed.

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Outputs:

NOTE: The outputs are also monitored by the display panel circuit logic to check circuit operation. If the circuit is not operating properly, the display panel will display a fault code on the LCD display.

X7 Connector:

- X7 terminal N (304A Yel)—voltage out to the fuel relay coil when operating conditions are met.
- X7 terminal B (302 Red)—voltage out to the fuel shutoff solenoid hold-in coil when conditions are met.
- X7 terminal C (518A Gry)—voltage out to the start relay coil when operating conditions are met.

X11 Connector:

- X11 terminal B (135A Grn)—voltage out to the right turn/hazard light, either pulsing or constant based on inputs.
- X11 terminal C (145A Grn)—voltage out to the left turn/hazard light, either pulsing or constant based on inputs.

Grounds:

X7 Connector:

- X7 terminal P (050E Blk)—provides one of two permanent ground circuits for the display panel.

X11 Connector:

- X11 terminal H (050D Blk)—provides one of two permanent ground circuits for the display panel.

eHydro™/Auto HST Communication:

X7 Connector:

- X7 terminal R (924A Yel)—provides input communication to the display panel from the electronic drive controller.
- X7 terminal S (925A Grn)—provides output communication from the display panel to the electronic drive controller.

KN52281,100443E -19-02NOV12-2/2

Display Panel Operation—MY13

Function

To display operational information to the operator as to various circuit conditions, example; turn signal on, or PTO on, or fuel level, or diagnostic fault codes.

To perform logic safety interlock to control safe starting, operation and shutoff of the machine engine.

Operating Conditions

- Key switch in run or start position

Theory of Operation

The display panel is an electronic circuit board which performs various logic functions based upon input and output signals as well as being a display for the various instruments and indicator lights.

The only functions that do not provide an input to, or receive an output from the display panel, are the headlights, work lights, tail lights, manifold heater, and fuel pump circuits. All other electrical functions connect to the display panel for some part of their operation.

The display panel receives unswitched voltage at the X10 connector terminal D, 122E Red wire, and H, 122D Red wire, and switched voltage at terminal A, 562H Red. This provides the voltage to power up and operate the display panel.

The display panel has a permanent ground circuit through the X7 connector 050E Blk wire, and X11 connector 050D Blk wires. The 050E and 050D Blk wires splice the 050A Blk wire to frame ground.

The display panel operates with an IF—THEN logic where combinations of voltage inputs (IF's) to the display panel produce combinations of output voltages and/or ground path(s) (THEN's).

Example:

IF voltage is provided to the display panel by the key switch being in the run position, and IF the operator is on the seat;

or,

IF voltage is provided to the display panel by the key switch being in the run position, and IF the operator is off the seat, and IF the park brake is locked, and IF the transmission is in neutral (PRT);

THEN voltage is supplied to the fuel shutoff solenoid relay and fuel shutoff solenoid hold-in coil providing the requirements to keep the machine engine running.

The fuel shutoff solenoid is held in the energized state by voltage provided from the display panel. The fuel relay is initially energized, closing its contacts and providing voltage to the fuel shutoff solenoid pull-in coil. After a short delay, the display panel energizes the fuel shutoff solenoid hold-in coil circuit.

The display panel contains a 0.5 second delay timer, controlling the voltage to the fuel relay. The timer is activated if the operator rises off the seat. 0.5 seconds after the operator leaves the seat, voltage to the fuel solenoid will stop, de-energizing it, closing the fuel shutoff solenoid valve and stopping the engine.

Inputs

The display panel has 4 connectors (X6, X7, X10, and X11) connecting 33 wires to the display panel to provide the inputs, outputs, and grounds.

NOTE: The results listed for each input and output, are based upon the operating conditions for that circuit being met. See the individual circuit operation for specific diagnostic procedures.

X6 Connector

- X6 terminal A (334A Yel)—voltage in from the alternator (alternator running) will turn the battery indicator light off.
- X6 terminal B (573 Org)—voltage in from the rear PTO switch (PTO in the RIO position) will provide input to fuel, starting, and off seat logic as well as illuminate the mid PTO indicator light when voltage is present.
- X6 terminal C (383C Org)—voltage in from the aid position of the key switch (manifold heater circuit) will turn the engine preheat light on.
- X6 terminal D (125 Grn)—voltage in from the turn signal switch (right turn) will turn the right turn indicator light on and start the logic to provide an output to the right turn signal light circuit.
- X6 terminal E (115 Grn)—voltage in from the turn signal switch (left turn) will turn the left turn indicator light on and start the logic to provide an output to the left turn signal light circuit.
- X6 terminal F (777A Pur)—voltage in from the S11 rear PTO sensing switch (switch on) will turn the PTO light(s) on. (See [Rear and Mid PTO Circuit Operation](#).)

X7 Connector

- X7 terminal A (555A Grn)—voltage in from the MFWD engagement sensing switch (MFWD engaged) will turn the MFWD indicator light on.
- X7 terminal D (572A Red)—voltage in from the start position of the key switch (cranking circuit) will start the logic to provide an output to the start relay if operating conditions are met.
- X7 terminal G (908 Gry)—voltage in from the display mode switch. (See [Display Mode Switch Circuit Operation](#).)
- X7 terminal K (574A Yel)—voltage in from the rear PTO switch (PTO on) will provide input to fuel, starting, and off seat logic as well as illuminate the rear PTO indicator light when voltage is removed.
- X7 terminal L (539A Wht)—voltage in from the seat switch (operator on seat) will provide input to fuel, starting, and off seat logic.

Continued on next page

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- X7 terminal M (103 Org)—voltage in from the headlight switch (hazard position) will turn the right and left turn indicator lights on and start the logic to provide an output to the right and left hazard lights circuit.

X10 Connector

- X10 terminal A (562H Red)—voltage in from the switched power circuit (key switch in run position) turns on the display panel.
- X10 terminal B (519 Wht)—voltage in from the transmission neutral switch (transmission in neutral) (eHydro™ uses a jumper in place of the transmission neutral switch) will provide input to fuel, starting, and off seat logic.
- X10 terminal C (353A Org)—resistance in (approximately 9 ohms full to 89 ohms empty) from the fuel level sensor will complete the circuit for the fuel gauge to indicate the approximate fuel level within the fuel tank. This will also cause display panel logic to display a low fuel message on the LCD display when the fuel level is near empty (approximately 90 ohms or greater).
- X10 terminal D (122E Red)—voltage in from the battery for one of two operating power supplies.
- X10 terminal E (359A Wht)—resistance in (approximately 22 ohms full hot to 520 ohms full cold) from the engine coolant temperature sensor will complete the circuit for the coolant temperature gauge to indicate the approximate engine coolant temperature.
- X10 terminal F (565A Dk Grn)—frequency in from the front implement detector will provide input to the display panel that implement is on the front hitch.
- X10 terminal G (351A Brn)—voltage in from the air filter restriction switch (filter clogged) will turn the intake air restriction indicator light on.
- X10 terminal H (122D Red)—voltage in from the battery for one of two operating power supplies.
- X10 terminal J (347A Pur)—ground in from the engine oil pressure switch (oil pressure less than 40 kPa (5.8 psi)) will turn the engine oil pressure indicator light on.
- X10 terminal K (586A Blu)—voltage in from the park brake switch (park brake locked) will provide input to fuel, starting, and off seat logic as well as illuminate the park brake indicator light.

X11 Connector

- X11 terminal D (594A Yel)—voltage in from the switched power circuit (key switch in run position). If the mid PTO is installed, this input is also controlled through the mid

PTO switch (PTO off) will provide input to fuel, starting, and off seat logic as well as illuminate the mid PTO indicator light when voltage is removed.

Outputs

NOTE: The outputs are also monitored by the display panel circuit logic to check circuit operation. If the circuit is not operating properly, the display panel will display a fault code on the LCD display.

X7 Connector

- X7 terminal B (302 Red)—voltage out to the fuel shutoff solenoid hold-in coil when conditions are met.
- X7 terminal C (518A Gry)—voltage out to the start relay coil when operating conditions are met.
- X7 terminal N (304A Yel)—voltage out to the fuel relay coil when operating conditions are met.
- X7 terminal F (747A pur)—voltage out to the rear PTO solenoid when conditions are met.

X11 Connector

- X11 terminal B (135A Grn)—voltage out to the right turn/hazard light, either pulsing or constant based on inputs.
- X11 terminal C (145A Grn)—voltage out to the left turn/hazard light, either pulsing or constant based on inputs.

Grounds

X7 Connector

- X7 terminal P (050E Blk)—provides one of two permanent ground circuits for the display panel.

X11 Connector

- X11 terminal H (050D Blk)—provides one of two permanent ground circuits for the display panel.

eHydro™/Auto HST Communication

X7 Connector

- X7 terminal R (924A Yel)—provides input communication to the display panel from the electronic drive controller.
- X7 terminal S (925A Grn)—provides output communication from the display panel to the electronic drive controller.

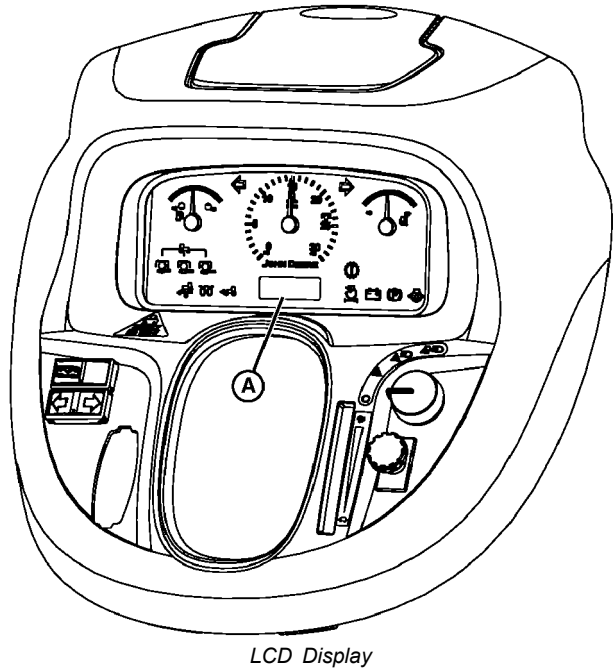
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Display Panel LCD Message

- Specific messages are displayed on the liquid crystal display (LCD) for machine operation.

A—LCD Display



LCD Display

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LV15729 —UN—04MAY12

- Instrument Panel LCD Display Messages

LoFUEL = Low Fuel

tEnPHI = Hi Coolant Temperature

nE'Ut oF = Neutral Safety Switch Off

PtOO n = PTO On

FPtO = Front PTO On

EnGrUn = Engine Running

LCD Display Messages

LV15710 —UN—04MAY12

Representation of the Message Displayed	Description of the Message
LoFUEL	The fuel gauge needle has gone into the red zone. Appears only once during the power cycle.
tEnPHI	The coolant temperature needle has gone into the red zone. Appears only once during the power cycle.
nEUtoF	Gear Tractors - The operator is out of the seat and the transmission is in gear. HST Tractors - The neutral wire jumper cap located under the left foot deck has been removed or is loose.
PtOOn	The operator is not in the seat, the park brake was not set, and the PTO switch is on.
FPtO	The operator is not in the seat and the front PTO switch is on. (EEC only)
EnGrUn	The engine is already running and there is an attempt to start the engine.

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Display Panel Diagnosis

See the individual circuit operation for specific diagnostic procedures.

KN52281,1004441 -19-02NOV12-1/1

Display Mode Switch Circuit Operation—NA

Function:

To roll the LCD display between displaying hour, travel speed, and switch settings.

This switch is also used to enter the configuration mode of the display panel to configure the display to the machine and options installed.

eHydro™/Auto HST only—The switch can also be used to enter into the calibration and diagnostic modes for the drive controller and related sensors.

Operating Conditions:

- Key switch in run or start position

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Theory of Operation:

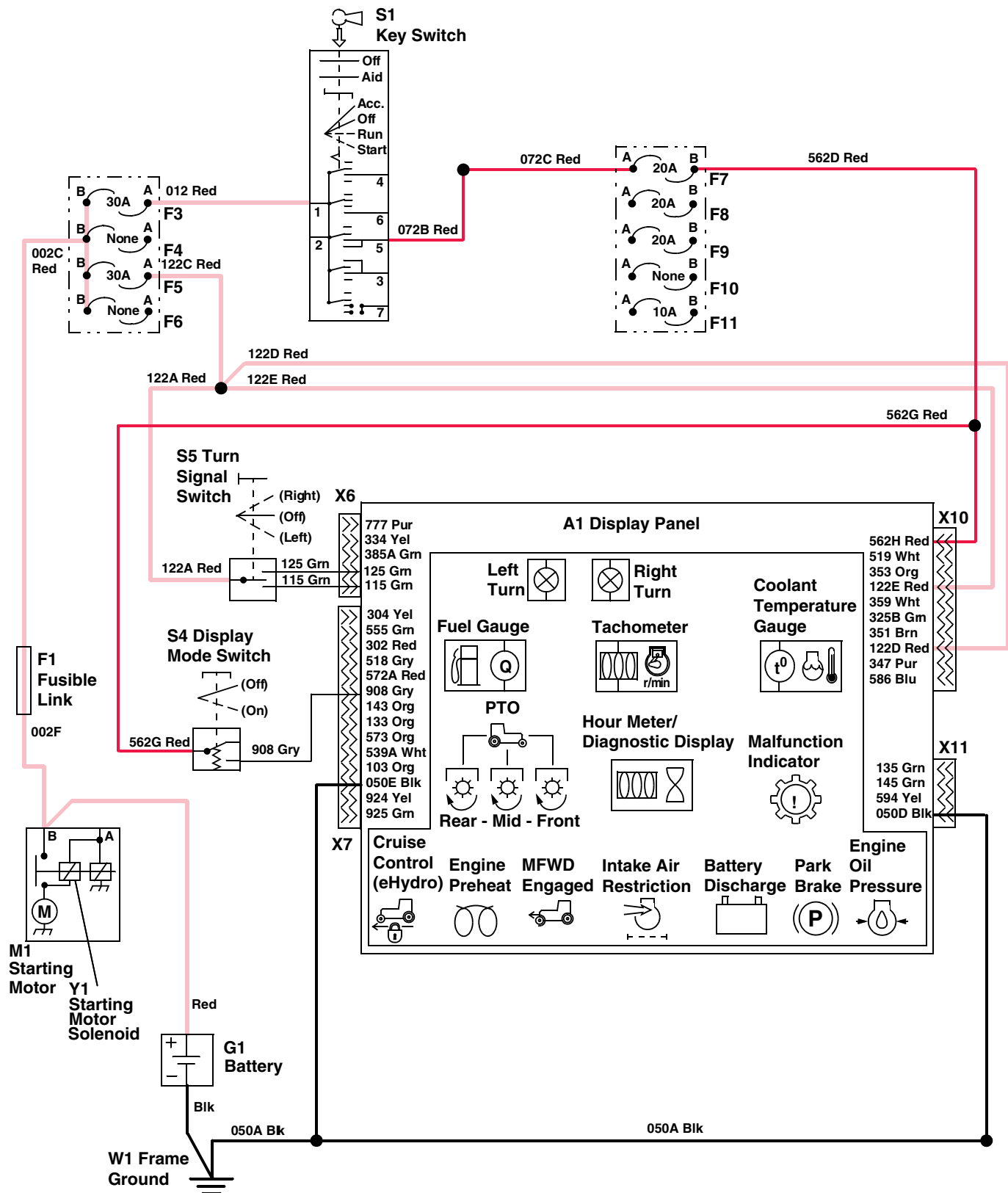
The display mode switch is a momentary contact switch used to change the display message in the LCD and to change the configuration setting of the display panel.

The turn signal switch is also used to enter setup information when the display mode switch is held in the on position. See Display Setup Procedures.

Switched power is supplied from the key switch, 072B and 072C Red wires, F7 fuse, 562D and 562G Red wires to the display mode switch. When the display mode switch is depressed, power is supplied to the 908 Gry wire and the display panel through the X7 connector at terminal G.

KN52281,1004442 -19-16JAN13-1/1

Display Mode Switch Circuit Electrical Schematic—Pre MY08



LVAL11650 —UN—02NOV10

Continued on next page

KN52281,1004443 -19-02NOV12-1/2

F1— Fusible Link
 F3— Fuse 30A
 F4— Not Used
 F5— Fuse 30A
 F6— Not Used
 F7— Fuse 20A
 F8— Fuse 20A
 F9— Fuse 20A
 F10— Not Used

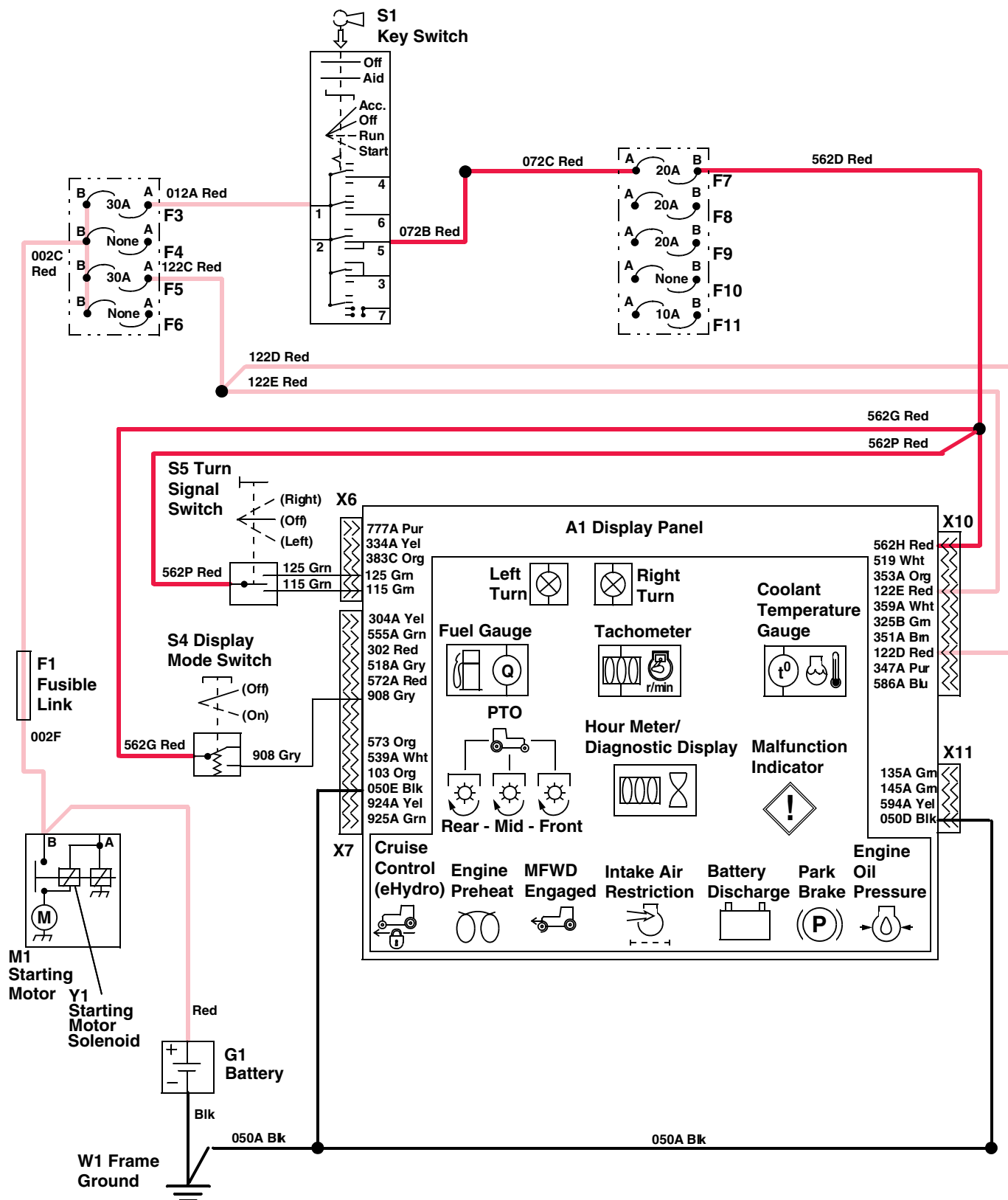
F11— Fuse 10A
 G1—Battery
 M1—Starting Motor
 S1— Key Switch
 S4— Display Mode Switch
 S5— Turn Signal Switch
 W1—Frame Ground

X6— W1 Main Wiring
 Harness-to-A1 Display Panel
 X7— W1 Main Wiring
 Harness-to-A1 Display Panel
 X10— W1 Main Wiring
 Harness-to-A1 Display
 Panel

X11— W1 Main Wiring
 Harness-to-A1 Display
 Panel
 Y1— Starting Motor Solenoid

KN52281,1004443 -19-02NOV12-2/2

Display Mode Switch Circuit Electrical Schematic—MY08



LVAL11651 —UN—02NOV10

Continued on next page

KN52281,1004444 -19-02NOV12-1/2

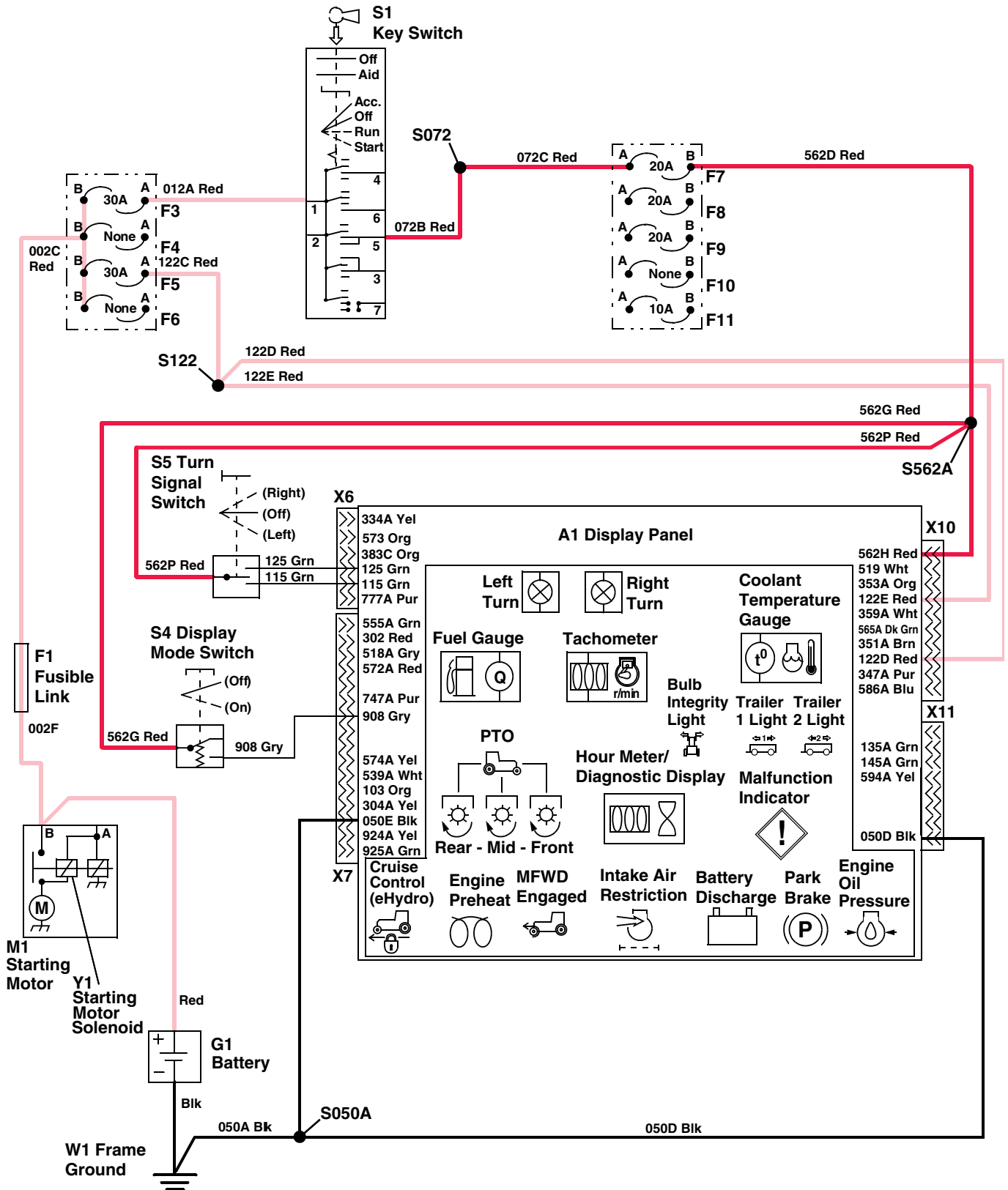
F1— Fusible Link
F3— Fuse 30A
F4— Not Used
F5— Fuse 30A
F6— Not Used
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A
F10— Not Used

F11— Fuse 10A
G1—Battery
M1—Starting Motor
S1— Key Switch
S4— Display Mode Switch
S5— Turn Signal Switch
W1—Frame Ground

X6— W1 Main Wiring Harness-to-A1 Display Panel	X11— W1 Main Wiring Harness-to-A1 Display Panel
X7— W1 Main Wiring Harness-to-A1 Display Panel	Y1— Starting Motor Solenoid
X10— W1 Main Wiring Harness-to-A1 Display Panel	

KN52281,1004444 -19-02NOV12-2/2

Display Mode Switch Circuit Electrical Schematic—MY13



LVAL38734 —UN—05DEC12

Continued on next page

KN52281,1004445 -19-10DEC12-1/2

F1— Fusible Link
F3— Fuse 30A
F4— Not Used
F5— Fuse 30A
F6— Not Used
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A
F10— Not Used

F11— Fuse 10A
G1—Battery
M1—Starting Motor
S1—Key Switch
S4— Display Mode Switch
S5— Turn Signal Switch
W1—Frame Ground

X6—W1 Main Wiring
Harness-to-A1 Display Panel
X7—W1 Main Wiring
Harness-to-A1 Display Panel
X10— W1 Main Wiring
Harness-to-A1 Display
Panel

X11— W1 Main Wiring
Harness-to-A1 Display
Panel
Y1—Starting Motor Solenoid

KN52281,1004445 -19-10DEC12-2/2

Display Mode Switch Circuit Diagnosis

Test Procedure A

Test Conditions:

- Park brake locked.

- Key switch in run position, engine not running.
- Turn signal light circuit functional, (See [Turn Signal Lights Circuit Diagnosis—Pre MY08](#) in Section 40, Group 35.)
- Display mode switch pressed for each test.

KN52281,1004446 -19-02NOV12-1/5

Display Mode Circuit

KN52281,1004446 -19-02NOV12-2/5

Step 1

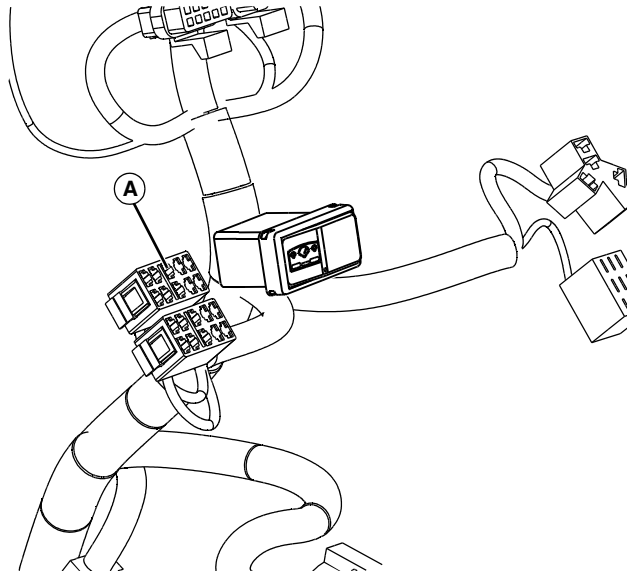
Does the LCD display change display information each time the display mode switch is pressed and released?

YES: Circuit and display panel are functional.

NO: Go to next step.

KN52281,1004446 -19-02NOV12-3/5

Step 2



LVAL11652—UN—02NOV10

A—S4 Display Mode Switch, 562G Red Wire

Disconnect the display mode switch. Is battery voltage present at S4 display mode switch connector 562G Red wire (A)?

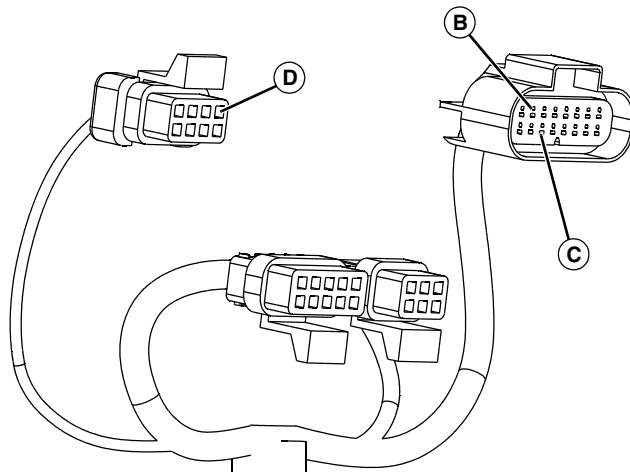
YES: Connect display mode switch. Go to next step.

NO: Check the F7 fuse. Check the 562D and 562G Red wires. Test unswitched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

Continued on next page

KN52281,1004446 -19-02NOV12-4/5

Step 3



LVAL11653 —UN—02NOV10

B—X7 Display Panel Connector, Terminal G, 908 Gry Wire

C—X7 Display Panel Connector, 050E Gry Blk Wire

D—X7 Display Panel Connector, 050D Blk Wire

Disconnect X7 connector to the display panel. Is battery voltage present at terminal G, 908 Gry wire (B) when display mode switch is pressed?

YES: Connect X7 connector. Check ground wires 050E (C) and 050D (D) Blk. Check power into the display panel. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.) If ground and power are OK, replace display panel.

NO: Check 908 Gry wire and connections. Test display mode switch. (See [Display Mode Switch Test](#) in Section 40, Group 40.)

KN52281,1004446 -19-02NOV12-5/5

**Display Mode Switch Circuit
Diagnosis—MY13**

Test Procedure A

Test Conditions

- Park brake locked.
- Key switch in run position, engine not running.
- Turn signal light circuit functional (see [Turn Signal Lights Circuit Diagnosis—MY13](#) in Section 40, Group 40).
- Display mode switch pressed for each test.

KN52281,1004447 -19-21JAN13-1/5

Display Mode Circuit

KN52281,1004447 -19-21JAN13-2/5

Step 1

Does the LCD display change display information each time the display mode switch is pressed and released?

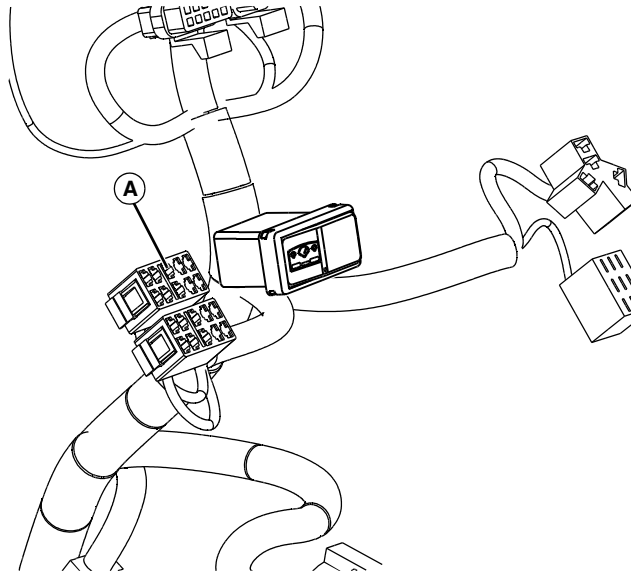
YES: Circuit and display panel are functional.

NO: Go to next step.

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KN52281,1004447 -19-21JAN13-3/5

Step 2



LVAL11652—UN—02NOV10

A—S4 Display Mode Switch, 562G Red Wire

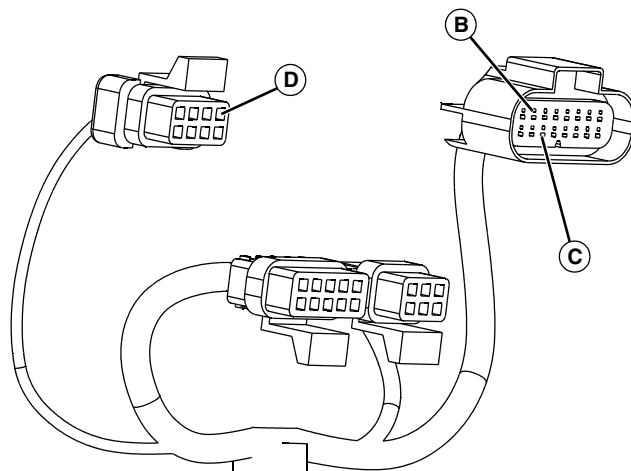
Disconnect the display mode switch. Is battery voltage present at S4 display mode switch connector 562G Red wire (A)?

YES: Connect display mode switch. Go to next step.

NO: Check the F7 fuse. Check the 562D and 562G Red wires. Test unswitched power circuit. (See [Power Circuit Diagnosis—MY13—NA](#) in Section 40, Group 40.)

KN52281,1004447 -19-21JAN13-4/5

Step 3



LVAL11653—UN—02NOV10

B—X7 Display Panel Connector, Terminal G, 908 Gry Wire

C—X7 Display Panel Connector, 050E Gry Blk Wire

D—X11 Display Panel Connector, 050D Blk Wire

Disconnect X7 connector to the display panel. Is battery voltage present at terminal G, 908 Gry wire (B) when display mode switch is pressed?

YES: Connect X7 connector. Check ground wires 050E (C) and 050D (D) Blk. Check power into the display panel. (See [Power Circuit Diagnosis—MY13—NA](#) in Section 40, Group 40.)

If ground and power are OK, replace display panel.

NO: Check 908 Gry wire and connections. Test display mode switch. (See [Display Mode Switch Test](#) in Section 40, Group 45.)

KN52281,1004447 -19-21JAN13-5/5

eHydro™—eMatchOS Electronic Drive Controller

Function:

The purpose of the drive controller is to control both the drive direction and speed of the machine. Additionally the drive controller provides for setting a maximum travel speed, cruise control, pedal aggressiveness, and load match to prevent stalling the engine during operation.

Each of these additional functions has the ability to be turned on or off by the operator.

General Theory:

The drive controller is a preprogramming electrical device that allows the operator to control the machine drive direction and speed via the electrical inputs from the forward and reverse foot pedals. Under normal operating conditions, this creates an output to the corresponding directional control valve coil in the transmission.

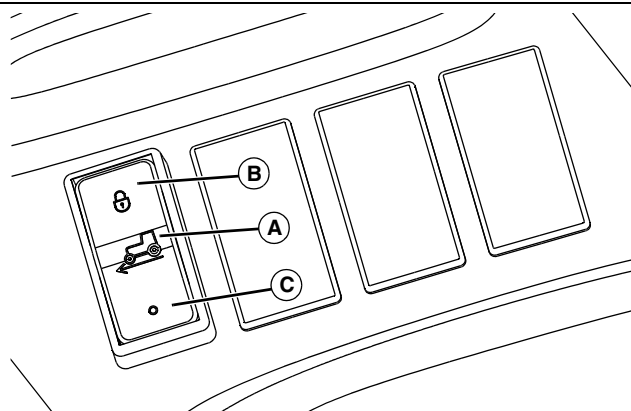
The output current to the directional valve coil is proportional to the pedal position. The forward and reverse pedals have an adjustable proportional setting (motion match). This setting allows for greater control, comfort and smoother operation around neutral. The same proportional setting affects both the forward and reverse command.

The rate of acceleration and deceleration is also controlled by the drive controller to smoothly ramp the speed up and down.

Cruise Control—Standard:

The cruise control feature allows the operator to set and hold a speed setting that the operator desires without having to press and hold the forward pedal.

The cruise control switch receives power from the switched power circuit on 552A, 552B and 552C Red



LVAL11654—UN—02NOV10

A—Cruise Control ON Position **C—Cruise Control OFF Position**
B—Cruise Control Set Position

wires. Placing the cruise control switch to the on (center) position, supplies power from the 552C Red wire across the switch to the 238 Gry wire to the drive controller. This input enables the cruise control function.

Momentarily pressing the cruise control switch to the lock position (B) supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller. This input will set the cruise speed at the speed being traveled.

Once set, the drive controller monitors the machine speed and varies the current to the transmission forward directional solenoid to maintain travel speed at the set point.

To adjust travel speed, disengage cruise control and engage cruise control again at a different speed.

Placing the cruise control switch in the off position (C) or pressing either the right brake pedal or reverse pedal will disengage the cruise function.

Continued on next page

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Cruise Control—Optional:

The cruise control feature allows the operator to set and hold a speed setting that the operator desires without having to press and hold the forward pedal.

The cruise/max speed switch receives power from the switched power circuit on 552A and 552C Red wires. The Res/ +, Set/—switch receives power from the switched power circuit on 552A and 552B Red wires.

Placing the cruise/max speed switch to the cruise position, (A) supplies power from the 552C Red wire across the switch to the 238 Gry wire to the drive controller. This input enables the cruise control function. Once the machine is traveling at the desired speed, momentarily pressing the Res/ +, Set/—switch to the Set/- position (B) supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller. This input will set the cruise speed at the speed being traveled.

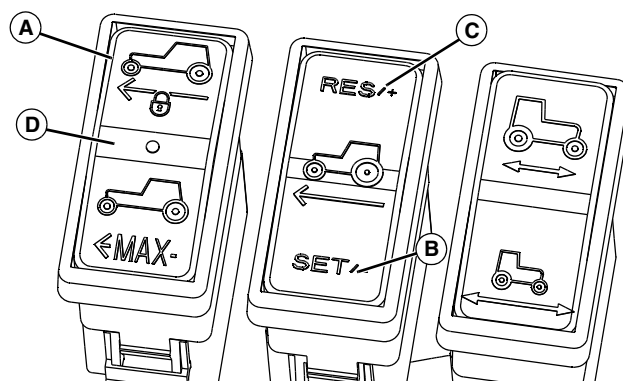
Once set, the drive controller monitors the machine speed and varies the current to the transmission forward directional solenoid to maintain travel speed at the set point.

The cruise speed setting can be increased and decreased while the machine is being driven by momentarily pressing either the Res/+ switch to increase the cruise speed or the Set/- switch to decrease the cruise speed setting.

Pressing the Res/+ side (C) of the switch supplies power from the 552B Red wire across the switch to the 266 Blu wire to the drive controller. Pressing the Set/- side (B) of the switch supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller.

Pressing Res/+, or Set/- positions of the switch to change the cruise speed setting will become effective immediately without returning to neutral.

The increase/decrease amount is a percentage of the actual machine speed.



A—Cruise Control ON Position
B—Cruise Control Set Position
C—Decrease Stored Speed Setting Position
D—Cruise Control OFF Position

Placing the cruise/max speed switch in the off (center) position (D) or pressing either the right brake pedal or reverse pedal will disengage the cruise function. The last speed setting is stored in the controller and if the operator is pressing the forward pedal, the Res/+ side (C) of the switch can be pressed to ramp back to the stored speed.

Placing the cruise/max speed switch in the off (center) position (D) erases the stored setting.

If changes in machine loading or range gear position settings do not allow for return to the previous speed setting, the controller will attempt to return to the speed setting by sending either the maximum (fastest speed possible) or minimum (slowest speed possible) drive current to the transmission forward directional solenoid.

Continued on next page

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Max Speed—Optional:

The max speed feature allows the operator to set the maximum speed the machine will travel when the drive pedal is fully depressed.

If the operator needs to return to a specific travel speed, the max speed setting will allow the machine to return to this specific speed setting while maintaining proportional acceleration and deceleration. Unlike cruise control, the max speed setting requires the operator to press and hold the drive pedal to obtain a travel function.

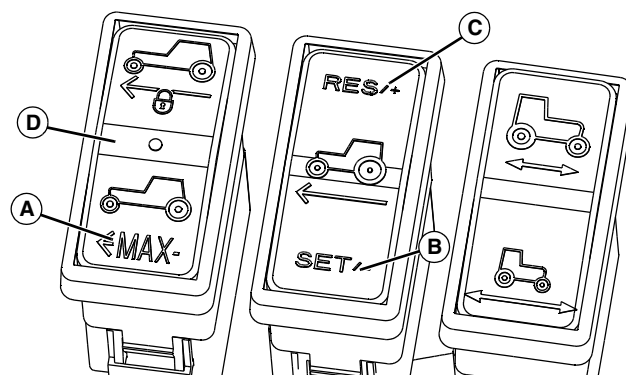
The cruise/max speed switch receives power from the switched power circuit on 552A and 552C Red wires. The Res/ +, Set/—switch receives power from the switched power circuit on 552A and 552B Red wires.

Placing the cruise/max speed switch to the max speed position (A), supplies power from the 552C Red wire across the switch to the 267 Pur wire to the drive controller. This input enables the max speed function. Once the machine is traveling at the desired speed, momentarily pressing the Res/ +, Set/—switch to the Set/- position (B) supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller. This input will set the max speed at the speed being traveled.

The maximum travel speed of the machine will then be limited to the speed the operator was traveling at as long as the max speed switch remains in the on position.

The max speed setting can be increased and decreased while the machine is being driven by momentarily pressing either the Res/+ side (C) of the switch to increase the max speed or the Set/- side (B) of the switch to decrease the max speed setting.

Pressing the Res/+ side (C) of the switch supplies power from the 552B Red wire across the switch to the 266 Blu wire to the drive controller. Pressing the Set/- side (B) of the switch supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller.



A—Maximum Speed Setting Position
B—Cruise Control Set Position
C—Decrease Stored Speed Setting Position
D—Cruise Control OFF Position

Using the Res/+ side of the switch or the Set/- side of the switch to change the max speed setting will become effective immediately without returning to neutral. The increase/decrease amount is a percentage of the actual machine speed.

The max speed function is disengaged when the max speed switch is placed in the off (center) position (D). Disengagement will become effective immediately.

Once the max speed setting is set it will be stored and is available until it is replaced by another setting or if the drive controller is replaced. Placing the max speed switch in the on position (A) will enable the last maximum speed setting.

If changes in machine loading or range gear position settings do not allow for return to the previous speed setting, the controller will attempt to return to the speed setting by sending either the maximum (fastest speed possible) or minimum (slowest speed possible) drive current to the transmission forward directional solenoid.

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Motion Match Switch—Optional:

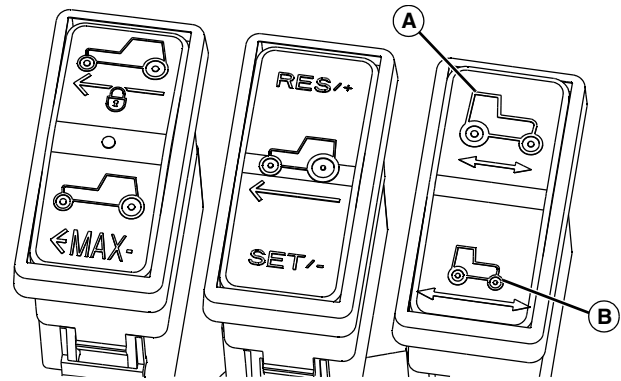
Motion Match enables the operator to adjust machine acceleration and deceleration rates.

Placing the motion match switch in the on position (A) will give the transmission higher response sensitivity to drive pedal movement. Shorter starting and stopping distances can be set for applications requiring rapid changes in direction, such as operating with a loader.

Placing the motion match switch in the off position (B) will give the drive pedals the sensitivity that is typical to most normal operating conditions. Longer starting and stopping distances can be set to avoid turf damage in other applications.

The motion match switch receives secondary switched power from the drive controller on 673A, 673E, and 673 Org wires.

When the motion match switch is in the on position (A), power is supplied from the 673 Org wire, across the



A—Motion Match ON Position B—Motion Match OFF Position

motion match switch to the 269 Wht wire to the drive controller. This enables the motion match function for quicker acceleration and deceleration rates.

Continued on next page

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LVAL11657 —UN—02NOV10

Load Match Switch:

Load match is used to eliminate operators stalling the engine during a typical application such as loader work. A throttle position sensor is installed to read the no-load engine rpm set point.

If the engine rpm drops far enough below the set point value, the current sent to the transmission drive valve coils is reduced to allow the engine to recover. The greater the load on the engine, the greater the reduction in current.

If cruise control is active and the load match comes on, the cruise speed output is held at whatever speed it is currently operating at until load match goes back to 100%.

The load match switch can be turned on or off to allow the operator to disable the load match function if desired.

The load match feature will have no effect if the machine is not being driven when the stalling load is being placed on the engine.

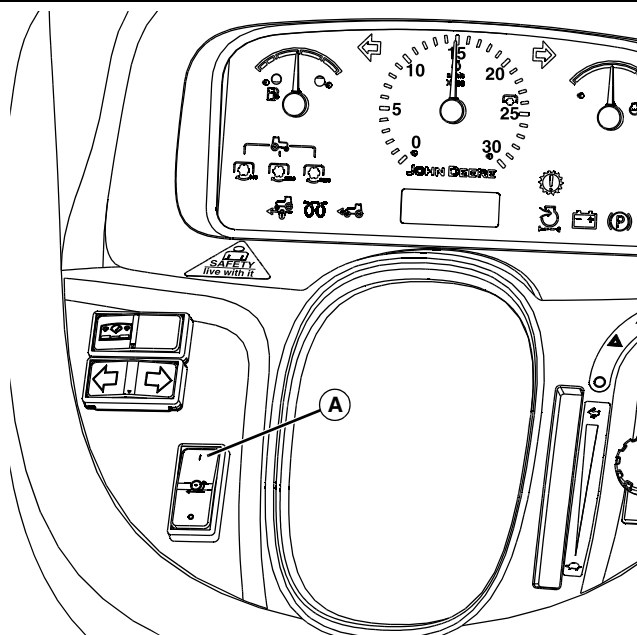
The load match switch receives power from the switched power circuit on 552A and 552E Red wires.

When the load match switch is in the on position (A), power is supplied from the 552E Red wire, across the load match switch to the 268 Gry wire to the drive controller. This enables the load match function to prevent the engine stalling during heavy load applications.

Drive Controller Inputs and Outputs

Inputs:

- Terminal A2 (267 Pur)—voltage in from the cruise/max speed switch, max speed on position.
- Terminal A3 (552A Red)—voltage in from the switched power circuit (key switch in accessory or run position) signals the drive controller. This power turns off when key switch is in the start position.
- Terminal B2 (265 Grn)—voltage in from the Res/ +, Set/—switch, Set/—position.
- Terminal B3 (238 Gry)—voltage in from the cruise/max speed switch, cruise control on position.
- Terminal C3 (269 Wht)—voltage in from the motion match switch, motion match on position.
- Terminal E1 (925 Grn)—provides input communication from the display panel to the drive controller.
- Terminal F1 (203 Org)—voltage in from the back up alarm (optional).
- Terminal F2 (686 Lt Blu)—voltage in from the forward pedal position sensor.
- Terminal F3 (325 Grn)—frequency in from the alternator, used to indicate the engine is running and for cruise control, max speed, load match, and motion match operation.
- Terminal G1 (247 Pur)—voltage in from the brake switch, right brake pedal depressed.



LVAL11658—UN—02NOV10

A—Load Match Switch ON Position

- Terminal G2 (499 Wht)—voltage in from the throttle position sensor.
- Terminal G3 (502 Red)—frequency in from the MFWD speed sensor.
- Terminal H1 (268 Gry)—voltage in from the load match switch, load match on position.
- Terminal H3 (687 Pur)—voltage in from the reverse pedal position sensor.
- Terminal J2 (266 Blu)—voltage in from the Res/ +, Set/—switch, Res/ + position.
- Terminal J3 (539 Wht)—voltage in from the seat switch, operator on seat.

Outputs:

- Terminal B1 (673A Org)—voltage out to the position sensors and motion match switch.
- Terminal H2 (924 Yel)—provides output communication to the display panel from the drive controller.
- Terminal K2 (696 Blu)—voltage/current out to the forward proportional solenoid.
- Terminal K3 (697 Pur)—voltage/current out to the reverse proportional solenoid.

Grounds:

- Terminal C2 (550A Blk)—ground in from the position sensors.
- Terminal E2 (050B Blk)—ground circuit for drive controller. Grounds back to frame ground through the X4 connector.

KN52281,1004448 -19-02NOV12-5/5

Auto HST—eMatchOS Electronic Drive Controller—MY08

Function:

The purpose of the drive controller is to control both the drive direction and speed of the machine. Additionally the drive controller provides for setting a maximum travel speed, cruise control and pedal aggressiveness.

Each of these additional functions has the ability to be turned on or off by the operator.

General Theory:

The drive controller is a preprogramming electrical device that allows the operator to control the machine drive direction and speed via the electrical inputs from the drive foot pedal and the position of the FNR switch. Under normal operating conditions, this creates an output to the corresponding directional control valve coil in the transmission.

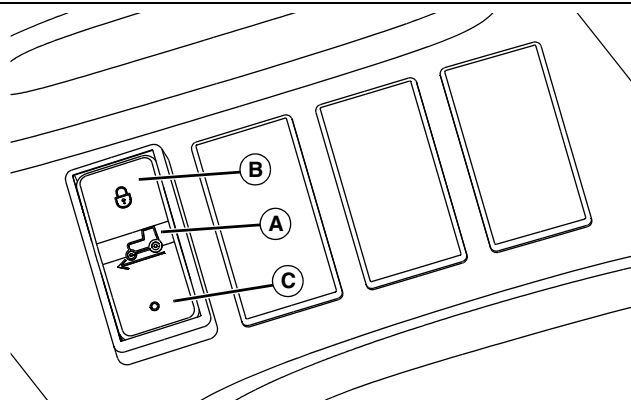
The output current to the directional valve coil is proportional to the pedal position. The drive pedal has an adjustable proportional setting (motion match). This setting allows for greater control, comfort and smoother operation around neutral. The same proportional setting affects both the forward and reverse command.

The rate of acceleration and deceleration is also controlled by the drive controller to smoothly ramp the speed up and down.

Cruise Control—Standard:

The cruise control feature allows the operator to set and hold a speed setting that the operator desires without having to press and hold the forward pedal.

The cruise control switch receives power from the switched power circuit on 552A, 552B and 552C Red



A—Cruise Control ON Position C—Cruise Control OFF Position
B—Cruise Control Set Position

wires. Placing the cruise control switch to the on (center) position, supplies power from the 552C Red wire across the switch to the 238 series Gry wire to the drive controller. This input enables the cruise control function.

Momentarily pressing the cruise control switch to the lock position (B) supplies power from the 552B Red wire across the switch to the 265 series Grn wires to the drive controller. This input will set the cruise speed at the speed being traveled.

Once set, the drive controller monitors the machine speed and varies the current to the transmission forward directional solenoid to maintain travel speed at the set point.

To adjust travel speed, disengage cruise control and engage cruise control again at a different speed.

Placing the cruise control switch in the off position (C) or pressing either the right brake pedal or reverse pedal will disengage the cruise function.

Continued on next page

KN52281,1004449 -19-02NOV12-1/4

LVAL11659—UN—02NOV10

Cruise Control—Optional:

The cruise control feature allows the operator to set and hold a speed setting that the operator desires without having to press and hold the forward pedal.

The cruise/max speed switch receives power from the switched power circuit on 552 series Red wires. The Res/+, Set/—switch receives power from the switched power circuit on 552A and 552B Red wires.

Placing the cruise/max speed switch to the cruise position, (A) supplies power from the 552C Red wire across the switch to the 238 Gry wire to the drive controller. This input enables the cruise control function. Once the machine is traveling at the desired speed, momentarily pressing the Res/+, Set/—switch to the Set/— position (B) supplies power from the 552B Red wire across the switch to the 265 series Grn wires to the drive controller. This input will set the cruise speed at the speed being traveled.

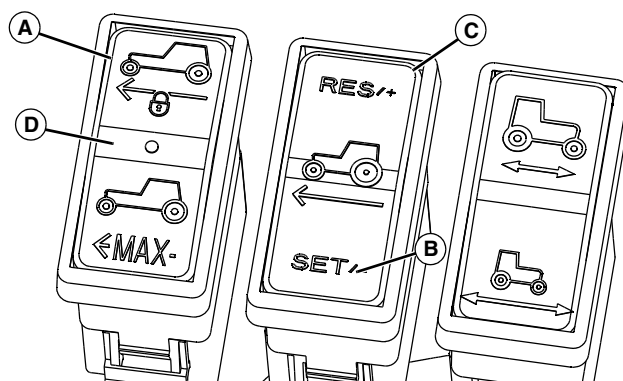
Once set, the drive controller monitors the machine speed and varies the current to the transmission forward directional solenoid to maintain travel speed at the set point.

The cruise speed setting can be increased and decreased while the machine is being driven by momentarily pressing either the Res/+ switch to increase the cruise speed or the Set/— switch to decrease the cruise speed setting.

Pressing the Res/+ side (C) of the switch supplies power from the 552B Red wire across the switch to the 266 series Blu wires to the drive controller. Pressing the Set/— side (B) of the switch supplies power from the 552B Red wire across the switch to the 265 series Grn wires to the drive controller.

Pressing Res/+, or Set/— positions of the switch to change the cruise speed setting will become effective immediately without returning to neutral.

The increase/decrease amount is a percentage of the actual machine speed.



A—Cruise Control ON Position
B—Cruise Control Set Position
C—Decrease Stored Speed Setting Position
D—Cruise Control OFF Position

Placing the cruise/max speed switch in the off (center) position (D) or pressing either the brake pedal or placing the FNR switch in neutral or reverse will disengage the cruise function. The last speed setting is stored in the controller and if the operator is pressing the drive pedal, the Res/+ side (C) of the switch can be pressed to ramp back to the stored speed.

Placing the cruise/max speed switch in the off (center) position (D) erases the stored setting.

If changes in machine loading or range gear position settings do not allow for return to the previous speed setting, the controller will attempt to return to the speed setting by sending either the maximum (fastest speed possible) or minimum (slowest speed possible) drive current to the transmission forward directional solenoid.

Continued on next page

KN52281,1004449 -19-02NOV12-2/4

Max Speed—Optional:

The max speed feature allows the operator to set the maximum speed the machine will travel when the drive pedal is fully depressed.

If the operator needs to return to a specific travel speed, the max speed setting will allow the machine to return to this specific speed setting while maintaining proportional acceleration and deceleration. Unlike cruise control, the max speed setting requires the operator to press and hold the drive pedal to obtain a travel function.

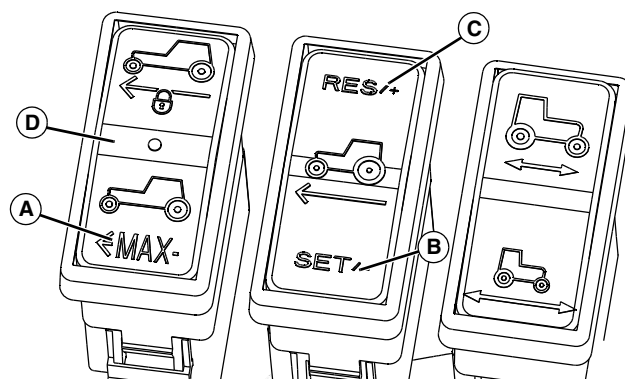
The cruise/max speed switch receives power from the switched power circuit on 552A and 552C Red wires. The Res/ +, Set/—switch receives power from the switched power circuit on 552A and 552B Red wires.

Placing the cruise/max speed switch to the max speed position (A), supplies power from the 552C Red wire across the switch to the 267 Pur wire to the drive controller. This input enables the max speed function. Once the machine is traveling at the desired speed, momentarily pressing the Res/ +, Set/—switch to the Set/- position (B) supplies series power from the 552B Red wire across the switch to the 265 Grn wires to the drive controller. This input will set the max speed at the speed being traveled.

The maximum travel speed of the machine will then be limited to the speed the operator was traveling at as long as the max speed switch remains in the on position.

The max speed setting can be increased and decreased while the machine is being driven by momentarily pressing either the Res/+ side (C) of the switch to increase the max speed or the Set/- side (B) of the switch to decrease the max speed setting.

Pressing the Res/+ side (C) of the switch supplies power from the 552B Red wire across the switch to the 266 Blu wire to the drive controller. Pressing the Set/- side (B) of the switch supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller.



A—Maximum Speed Setting Position
B—Cruise Control Set Position
C—Decrease Stored Speed Setting Position
D—Cruise Control OFF Position

Using the Res/+ side of the switch or the Set/- side of the switch to change the max speed setting will become effective immediately without returning to neutral. The increase/decrease amount is a percentage of the actual machine speed.

The max speed function is disengaged when the max speed switch is placed in the off (center) position (D). Disengagement will become effective immediately.

Once the max speed setting is set, it will be stored and is available until it is replaced by another setting or if the drive controller is replaced. Placing the max speed switch in the on position (A) will enable the last maximum speed setting.

If changes in machine loading or range gear position settings do not allow for return to the previous speed setting, the controller will attempt to return to the speed setting by sending either the maximum (fastest speed possible) or minimum (slowest speed possible) drive current to the transmission forward directional solenoid.

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KN52281,1004449 -19-02NOV12-3/4

Motion Match Switch—Optional:

Motion Match enables the operator to adjust machine acceleration and deceleration rates.

Placing the motion match switch in the on position (A) will give the transmission higher response sensitivity to drive pedal movement. Shorter starting and stopping distances can be set for applications requiring rapid changes in direction, such as operating with a loader.

Placing the motion match switch in the off position (B) will give the drive pedals the sensitivity that is typical to most normal operating conditions. Longer starting and stopping distances can be set to avoid turf damage in other applications.

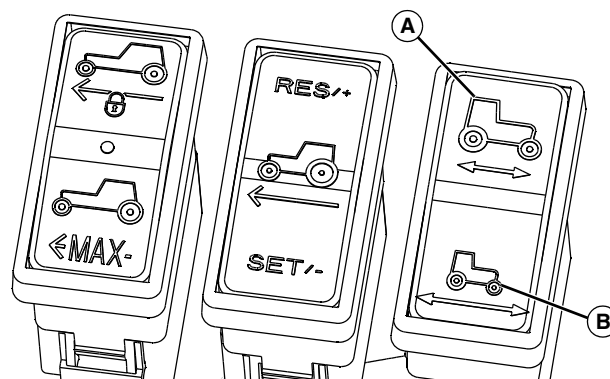
The motion match switch receives secondary switched power from the drive controller on 673A, 673E, and 673 Org wires.

When the motion match switch is in the on position (A), power is supplied from the 673 Org wire, across the motion match switch to the 269 Wht wire to the drive controller. This enables the motion match function for quicker acceleration and deceleration rates.

Drive Controller Inputs and Outputs

Inputs:

- Terminal A1 (529 Wht)—provides voltage in from FNR switch (Neutral).
- Terminal A2 (267A Pur)—voltage in from the cruise/max speed switch, max speed on position.
- Terminal A3 (552N Red)—voltage in from the switched power circuit (key switch in accessory or run position) signals the drive controller. This power turns off when key switch is in the start position.
- Terminal B2 (265A Grn)—voltage in from the Res/ +, Set/—switch, Set/—position.
- Terminal B3 (238A Gry)—voltage in from the cruise/max speed switch, cruise control on position.
- Terminal C3 (269A Wht)—voltage in from the motion match switch, motion match on position.
- Terminal D2 (513 Org)—provides voltage in from the FNR switch (Forward).
- Terminal E1 (925A Grn)—provides input communication from the display panel to the drive controller.
- Terminal E3 (523 Org)—provides voltage in from the FNR switch (Reverse).
- Terminal F2 (686 Lt Blu)—voltage in from the drive pedal position sensor.



LVAL11662—UN—02NOV10

A—Motion Match ON Position B—Motion Match OFF Position

- Terminal F3 (325D Grn)—frequency in from the alternator, used to indicate the engine is running and for cruise control, max speed, and motion match operation.
- Terminal G1 (247B Pur)—voltage in from the brake switch, brake pedal depressed.
- Terminal G2 (499A Wht)—voltage in from the throttle position sensor.
- Terminal G3 (502A Red)—frequency in from the MFWD speed sensor.
- Terminal J2 (266A Blu)—voltage in from the Res/ +, Set/—switch, Res/ + position.
- Terminal J3 (539D Wht)—voltage in from the seat switch, operator on seat.

Outputs:

- Terminal B1 (673A Org)—voltage out to the position and speed sensors and motion match switch.
- Terminal H2 (924A Yel)—provides output communication to the display panel from the drive controller.
- Terminal K2 (696A Lt Blu)—voltage/current out to the forward proportional solenoid.
- Terminal K3 (697A Pur)—voltage/current out to the reverse proportional solenoid.

Grounds:

- Terminal C2 (550A Blk)—ground in from the position and speed sensors.
- Terminal E2 (050H Blk)—ground circuit for drive controller. Grounds back to frame ground through the X4 connector.

KN52281,1004449 -19-02NOV12-4/4

Auto HST—eMatchOS Electronic Drive Controller—MY13

Function

The purpose of the drive controller is to control both the drive direction and speed of the machine. Additionally the drive controller provides for setting a maximum travel speed, cruise control and pedal aggressiveness.

Each of these additional functions has the ability to be turned on or off by the operator.

General Theory

The drive controller is a preprogramming electrical device that allows the operator to control the machine drive direction and speed via the electrical inputs from the drive foot pedal and the position of the FNR switch. Under normal operating conditions, this creates an output to the corresponding directional control valve coil in the transmission.

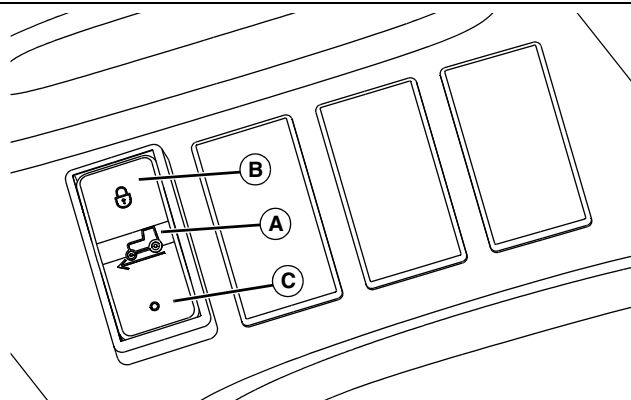
The output current to the directional valve coil is proportional to the pedal position. The drive pedal has an adjustable proportional setting (motion match). This setting allows for greater control, comfort and smoother operation around neutral. The same proportional setting affects both the forward and reverse command.

The rate of acceleration and deceleration is also controlled by the drive controller to smoothly ramp the speed up and down.

Cruise Control—Standard

The cruise control feature allows the operator to set and hold a speed setting that the operator desires without having to press and hold the forward pedal.

The cruise control switch receives power from the switched power circuit on 552A, 552B and 552C Red



A—Cruise Control ON Position B—Cruise Control Set Position C—Cruise Control OFF Position

wires. Placing the cruise control switch to the on (center (A) position, supplies power from the 552C Red wire across the switch to the 238A series Gry wire to the drive controller. This input enables the cruise control function.

Momentarily pressing the cruise control switch to the lock position (B) supplies power from the 552B Red wire across the switch to the 265A series Grn wires to the drive controller. This input will set the cruise speed at the speed being traveled.

Once set, the drive controller monitors the machine speed and varies the current to the transmission forward directional solenoid to maintain travel speed at the set point.

To adjust travel speed, disengage cruise control and engage cruise control again at a different speed.

Placing the cruise control switch in the off position (C) or pressing either the right brake pedal or reverse pedal will disengage the cruise function.

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KN52281,100444A -19-21JAN13-1/4

LVAL11659—UN—02NOV10

Cruise Control—Optional

The cruise control feature allows the operator to set and hold a speed setting that the operator desires without having to press and hold the forward pedal.

The cruise/max speed switch receives power from the switched power circuit on 552 series Red wires. The Res/+, Set/—switch receives power from the switched power circuit on 552A and 552B Red wires.

Placing the cruise/max speed switch to the cruise position, (A) supplies power from the 552C Red wire across the switch to the 238A Gry wire to the drive controller. This input enables the cruise control function. Once the machine is traveling at the desired speed, momentarily pressing the Res/+, Set/—switch to the Set/- position (B) supplies power from the 552B Red wire across the switch to the 265 series Grn wires to the drive controller. This input will set the cruise speed at the speed being traveled.

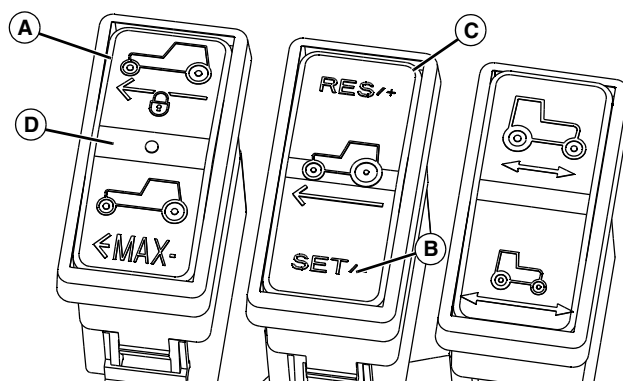
Once set, the drive controller monitors the machine speed and varies the current to the transmission forward directional solenoid to maintain travel speed at the set point.

The cruise speed setting can be increased and decreased while the machine is being driven by momentarily pressing either the Res/+ switch to increase the cruise speed or the Set/- switch to decrease the cruise speed setting.

Pressing the Res/+ side (C) of the switch supplies power from the 552B Red wire across the switch to the 266A series Lt Blu wires to the drive controller. Pressing the Set/- side (B) of the switch supplies power from the 552B Red wire across the switch to the 265 series Grn wires to the drive controller.

Pressing Res/+, or Set/- positions of the switch to change the cruise speed setting will become effective immediately without returning to neutral.

The increase/decrease amount is a percentage of the actual machine speed.



A—Cruise Control ON Position
B—Cruise Control Set Position
C—Decrease Stored Speed Setting Position
D—Cruise Control OFF Position

Placing the cruise/max speed switch in the off (center) position (D) or pressing either the brake pedal or placing the FNR switch in neutral or reverse will disengage the cruise function. The last speed setting is stored in the controller and if the operator is pressing the drive pedal, the Res/+ side (C) of the switch can be pressed to ramp back to the stored speed.

Placing the cruise/max speed switch in the off (center) position (D) erases the stored setting.

If changes in machine loading or range gear position settings do not allow for return to the previous speed setting, the controller will attempt to return to the speed setting by sending either the maximum (fastest speed possible) or minimum (slowest speed possible) drive current to the transmission forward directional solenoid.

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KN52281,100444A -19-21JAN13-2/4

Max Speed—Optional

The max speed feature allows the operator to set the maximum speed the machine will travel when the drive pedal is fully depressed.

If the operator needs to return to a specific travel speed, the max speed setting will allow the machine to return to this specific speed setting while maintaining proportional acceleration and deceleration. Unlike cruise control, the max speed setting requires the operator to press and hold the drive pedal to obtain a travel function.

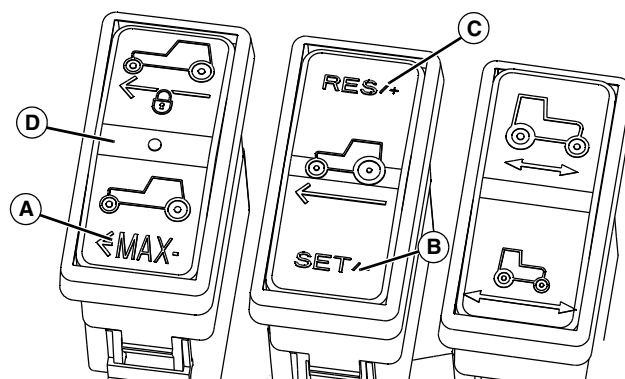
The cruise/max speed switch receives power from the switched power circuit on 552A and 552C Red wires. The Res/ +, Set/—switch receives power from the switched power circuit on 552A and 552B Red wires.

Placing the cruise/max speed switch to the max speed position (A), supplies power from the 552C Red wire across the switch to the 267A Pur wire to the drive controller. This input enables the max speed function. Once the machine is traveling at the desired speed, momentarily pressing the Res/ +, Set/—switch to the Set/— position (B) supplies series power from the 552B Red wire across the switch to the 265 Grn wires to the drive controller. This input will set the max speed at the speed being traveled.

The maximum travel speed of the machine will then be limited to the speed the operator was traveling at as long as the max speed switch remains in the on position.

The max speed setting can be increased and decreased while the machine is being driven by momentarily pressing either the Res/+ side (C) of the switch to increase the max speed or the Set/- side (B) of the switch to decrease the max speed setting.

Pressing the Res/+ side (C) of the switch supplies power from the 552B Red wire across the switch to the 266 Blu wire to the drive controller. Pressing the Set/- side (B) of the switch supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller.



A—Maximum Speed Setting Position
B—Cruise Control Set Position
C—Decrease Stored Speed Setting Position
D—Cruise Control OFF Position

Using the Res/+ side of the switch or the Set/- side of the switch to change the max speed setting will become effective immediately without returning to neutral. The increase/decrease amount is a percentage of the actual machine speed.

The max speed function is disengaged when the max speed switch is placed in the off (center) position (D). Disengagement will become effective immediately.

Once the max speed setting is set, it will be stored and is available until it is replaced by another setting or if the drive controller is replaced. Placing the max speed switch in the on position (A) will enable the last maximum speed setting.

If changes in machine loading or range gear position settings do not allow for return to the previous speed setting, the controller will attempt to return to the speed setting by sending either the maximum (fastest speed possible) or minimum (slowest speed possible) drive current to the transmission forward directional solenoid.

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KN52281,100444A -19-21JAN13-3/4

Motion Match Switch—Optional

Motion Match enables the operator to adjust machine acceleration and deceleration rates.

Placing the motion match switch in the on position (A) will give the transmission higher response sensitivity to drive pedal movement. Shorter starting and stopping distances can be set for applications requiring rapid changes in direction, such as operating with a loader.

Placing the motion match switch in the off position (B) will give the drive pedals the sensitivity that is typical to most normal operating conditions. Longer starting and stopping distances can be set to avoid turf damage in other applications.

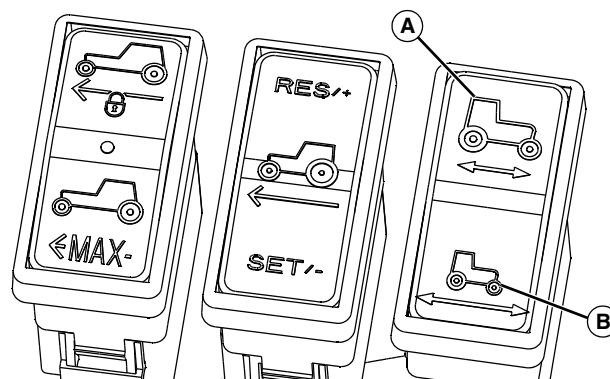
The motion match switch receives secondary switched power from the drive controller on 673A, 673E, and 673 Org wires.

When the motion match switch is in the on position (A), power is supplied from the 673 Org wire, across the motion match switch to the 269 Wht wire to the drive controller. This enables the motion match function for quicker acceleration and deceleration rates.

Drive Controller Inputs and Outputs

Inputs:

- Terminal A1 (529 Wht)—provides voltage in from FNR switch (Neutral).
- Terminal A2 (267A Pur)—voltage in from the cruise/max speed switch, max speed on position.
- Terminal A3 (552N Red)—voltage in from the switched power circuit (key switch in accessory or run position) signals the drive controller. This power turns off when key switch is in the start position.
- Terminal B2 (265A Grn)—voltage in from the Res/ +, Set/—switch, Set/—position.
- Terminal B3 (238A Gry)—voltage in from the cruise/max speed switch, cruise control on position.
- Terminal C3 (269A Wht)—voltage in from the motion match switch, motion match on position.
- Terminal D2 (513 Org)—provides voltage in from the FNR switch (Forward).
- Terminal E1 (925A Grn)—provides input communication from the display panel to the drive controller.
- Terminal E3 (523 Org)—provides voltage in from the FNR switch (Reverse).



LVAL11662—UN—02NOV10

A—Motion Match ON Position B—Motion Match OFF Position

- Terminal F2 (686 Lt Blu)—voltage in from the drive pedal position sensor.
- Terminal G1 (247B Pur)—voltage in from the brake switch, brake pedal depressed.
- Terminal G2 (499A Wht)—voltage in from the throttle position sensor.
- Terminal G3 (502A Red)—frequency in from the MFWD speed sensor.
- Terminal J2 (266A Blu)—voltage in from the Res/ +, Set/—switch, Res/ + position.
- Terminal J3 (539D Wht)—voltage in from the seat switch, operator on seat.

Outputs:

- Terminal B1 (673A Org)—voltage out to the position and speed sensors and motion match switch.
- Terminal H2 (924A Yel)—provides output communication to the display panel from the drive controller.
- Terminal K2 (696A Lt Blu)—voltage/current out to the forward proportional solenoid.
- Terminal K3 (697A Pur)—voltage/current out to the reverse proportional solenoid.

Grounds:

- Terminal C2 (550A Blk)—ground in from the position and speed sensors.
- Terminal E2 (050H Blk)—ground circuit for drive controller. Grounds back to frame ground through the X4 connector.

KN52281,100444A -19-21JAN13-4/4

eHydro™—Forward Drive Circuit Operation—Pre MY08

Function:

The forward drive circuit causes the electronic drive controller to propel the machine in a controlled forward direction.

Additionally the electronic drive controller provides for setting the following functions during a forward drive:

- Maximum travel speed
- Cruise control
- Motion match (pedal responsiveness)
- Load match

Each of these additional functions has the ability to be turned on or off by the operator.

Operating Conditions:

- Key switch in run position
- Engine running
- Operator on seat
- Park brake unlocked
- Forward pedal depressed

Theory of Operation:

The electronic drive controller (drive controller) is a preprogramming electrical device that allows the operator to control the machine forward drive function and speed via the electrical inputs from the forward foot pedal. Under normal operating conditions, this creates an output to the forward proportional solenoid in the transmission.

Current is supplied to the A2 drive controller from the two different switched power circuits.

With the key switch in the run or accessories position, current is supplied to the 212 Red wire, F11 fuse, 552 Red wire, X4 connector to the W9 wiring harness to the 552A and 552B Red wires and the A3 terminal of the X26 connector and the drive controller. This power supply is turned off when the key switch is in the start position.

These circuits power the drive controller to allow for drive control operation. The 673A Org wire splices to the 673B, 673C, 673D, 673E, and 673F Org wires to provide current from the drive controller to the throttle position sensor,

forward pedal sensor, reverse pedal sensor, motion match switch (optional), and the MFWD speed sensor respectively.

When the forward pedal is pressed, the forward pedal sensor rotates and sends voltage back to the drive controller through the 686 Lt Blu wire. The drive controller then processes the voltage from this input command into an output command if the proper operating conditions exist. The output command (current) to the forward proportional solenoid is proportional to the pedal position.

The proper conditions for a forward function will be:

- 12.0 volt input on 552B Red wire, power on,
- 12.0 volt input on wire 539 Wht wire, operator on seat,
- 5.0 volt output on wire 673A Org wire, sensor power,
- Continuity to ground on 550A Blk wire, sensor ground,
- Continuity to ground on 050B Blk wire, drive controller ground,
- Voltage input on the 686 Lt Blu wire, forward pedal pressed,
- Frequency input on the 325 Grn wire, engine speed from the alternator,
- Voltage input on the 499 Wht wire, throttle position sensor,
- Frequency input on the 502 Red wire, MFWD speed sensor,
- Voltage input on the 687 Pur wire, reverse pedal not pressed,
- Current output up to 1.9 amps on 696 Blu wire, forward proportional solenoid energized, and
- No current output on 697 Pur wire, reverse proportional solenoid not energized.

With the proper commands, the drive controller will ramp the output to the forward proportional solenoid to allow the machine to travel forward at a speed proportional to the position of the forward pedal, based upon the engine rpm and the range gear selected.

If at any time during the drive function the drive controller detects a problem with any of the input or output commands, the drive controller will provide output current on wire 924 Yel to the display panel. The LCD on the display panel will then display a fault code. This code can then be matched to the fault code chart to assist in the diagnosis of the problem.

KN52281,100444B -19-02NOV12-1/1

eHydro™—Forward Drive Circuit Operation—MY08

Function:

The forward drive circuit causes the electronic drive controller to propel the machine in a controlled forward direction.

Additionally the electronic drive controller provides for setting the following functions during a forward drive:

- Maximum travel speed
- Cruise control
- Motion match (pedal responsiveness)
- Load match

Each of these additional functions has the ability to be turned on or off by the operator.

Operating Conditions:

- Key switch in run position
- Engine running
- Operator on seat
- Park brake unlocked
- Forward pedal depressed

Theory of Operation:

The electronic drive controller (drive controller) is a preprogramming electrical device that allows the operator to control the machine forward drive function and speed via the electrical inputs from the forward foot pedal. Under normal operating conditions, this creates an output to the forward proportional solenoid in the transmission.

Current is supplied to the A2 drive controller from the two different switched power circuits.

With the key switch in the run or accessories position, current is supplied to the 212A Red wire, F11 fuse, 552 Red series wires, X4 connector to the W9 wiring harness to the 552A and 552B Red wires and the A3 terminal of the X26 connector and the drive controller. This power supply is turned off when the key switch is in the start position.

These circuits power the drive controller to allow for drive control operation. The 673A Org wire splices to the 673B, 673C, 673D, 673E, and 673F Org wires to provide current from the drive controller to the throttle position sensor,

forward pedal sensor, reverse pedal sensor, motion match switch (optional), and the MFWD speed sensor respectively.

When the forward pedal is pressed, the forward pedal sensor rotates and sends voltage back to the drive controller through the 686 Lt Blu wire. The drive controller then processes the voltage from this input command into an output command if the proper operating conditions exist. The output command (current) to the forward proportional solenoid is proportional to the pedal position.

The proper conditions for a forward function will be:

- 12.0 volt input on 552N Red wire, power on,
- 12.0 volt input on wire 539A Wht wire, operator on seat,
- 5.0 volt output on wire 673A Org wire, sensor power,
- Continuity to ground on 550A Blk wire, sensor ground,
- Continuity to ground on 050B Blk wire, drive controller ground,
- Voltage input on the 686 Lt Blu wire, forward pedal pressed,
- Frequency input on the 325D Grn wire, engine speed from the alternator,
- Voltage input on the 499A Wht wire, throttle position sensor,
- Frequency input on the 502A Red wire, MFWD speed sensor,
- Voltage input on the 687 Pur wire, reverse pedal not pressed,
- Current output up to 1.9 amps on 696 Blu wire, forward proportional solenoid energized, and
- No current output on 697 Pur wire, reverse proportional solenoid not energized.

With the proper commands, the drive controller will ramp the output to the forward proportional solenoid to allow the machine to travel forward at a speed proportional to the position of the forward pedal, based upon the engine rpm and the range gear selected.

If at any time during the drive function the drive controller detects a problem with any of the input or output commands, the drive controller will provide output current on wire 924 Yel to the display panel. The LCD on the display panel will then display a fault code. This code can then be matched to the fault code chart to assist in the diagnosis of the problem.

KN52281,100444C -19-02NOV12-1/1

eHydro™—Forward Drive Circuit Operation—MY13

Function

The forward drive circuit causes the electronic drive controller to propel the machine in a controlled forward direction.

Additionally the electronic drive controller provides for setting the following functions during a forward drive:

- Maximum travel speed
- Cruise control
- Motion match (pedal responsiveness)
- Load match

Each of these additional functions has the ability to be turned on or off by the operator.

Operating Conditions

- Key switch in run position
- Engine running
- Operator on seat
- Park brake unlocked
- Forward pedal depressed

Theory of Operation

The electronic drive controller (drive controller) is a preprogramming electrical device that allows the operator to control the machine forward drive function and speed via the electrical inputs from the forward foot pedal. Under normal operating conditions, this creates an output to the forward proportional solenoid in the transmission.

Current is supplied to the A2 drive controller from the two different switched power circuits.

With the key switch in the run or accessories position, current is supplied to the 212A Red wire, F11 fuse, 552 Red series wires, X4 connector to the W9 wiring harness to the 552A and 552B Red wires and the A3 terminal of the X26 connector and the drive controller. This power supply is turned off when the key switch is in the start position.

These circuits power the drive controller to allow for drive control operation. The 673A Org wire splices to the 673B, 673C, 673D, 673E, and 673F Org wires to provide current from the drive controller to the throttle position sensor,

forward pedal sensor, reverse pedal sensor, motion match switch (optional), and the MFWD speed sensor respectively.

When the forward pedal is pressed, the forward pedal sensor rotates and sends voltage back to the drive controller through the 686 Lt Blu wire. The drive controller then processes the voltage from this input command into an output command if the proper operating conditions exist. The output command (current) to the forward proportional solenoid is proportional to the pedal position.

The proper conditions for a forward function will be:

- 12.0 volt input on 552N Red wire, power on,
- 12.0 volt input on wire 539A Wht wire, operator on seat,
- 5.0 volt output on wire 673A Org wire, sensor power,
- Continuity to ground on 550A Blk wire, sensor ground,
- Continuity to ground on 050H Blk wire, drive controller ground,
- Voltage input on the 686 Lt Blu wire, forward pedal pressed,
- Frequency input on the 325D Grn wire, engine speed from the alternator,
- Voltage input on the 499A Wht wire, throttle position sensor,
- Frequency input on the 502A Red wire, MFWD speed sensor,
- Voltage input on the 687 Pur wire, reverse pedal not pressed,
- Current output up to 1.9 amps on 696 Blu wire, forward proportional solenoid energized, and
- No current output on 697 Pur wire, reverse proportional solenoid not energized.

With the proper commands, the drive controller will ramp the output to the forward proportional solenoid to allow the machine to travel forward at a speed proportional to the position of the forward pedal, based upon the engine rpm and the range gear selected.

If at any time during the drive function the drive controller detects a problem with any of the input or output commands, the drive controller will provide output current on wire 924 Yel to the display panel. The LCD on the display panel will then display a fault code. This code can then be matched to the fault code chart to assist in the diagnosis of the problem.

KN52281,100444D -19-21JAN13-1/1

Auto HST—Forward Drive Circuit Operation

Function:

The forward drive circuit causes the electronic drive controller to propel the machine in a controlled forward direction.

Additionally the electronic drive controller provides for setting the following functions during a forward drive:

- Maximum travel speed
- Cruise control
- Motion match (pedal responsiveness)

Each of these additional functions has the ability to be turned on or off by the operator.

Operating Conditions:

- Key switch in run position
- Engine running
- Operator on seat
- Park brake unlocked
- FNR switch in forward position
- Drive pedal depressed

Theory of Operation:

The electronic drive controller (drive controller) is a preprogramming electrical device that allows the operator to control the machine forward drive function and speed via the electrical inputs from the drive foot pedal and FNR switch. Under normal operating conditions, this creates an output to the forward proportional solenoid in the transmission.

Current is supplied to the A2 drive controller from two different switched power circuits.

With the key switch in the run or accessories position, current is supplied to the 212A Red wire, F11 fuse, 552 series Red wires, X4 connector to the W9 wiring harness to the 552 series Red wires and the A3 terminal of the X26 connector and the drive controller. This power supply is turned off when the key switch is in the start position.

These circuits power the drive controller to allow for drive control operation. The 673A Org wire splices to the 673C, 673D, 673F, and 673G Org wires to provide current from

the drive controller to the forward/drive pedal sensor, throttle position sensor, MFWD speed sensor, and reverse pedal sensor respectively.

When the drive pedal is pressed, the drive pedal sensor rotates and sends voltage back to the drive controller through the 686 Lt Blu wire. The drive controller then processes the voltage from this input command into an output command if the proper operating conditions exist. The output command (current) to the forward proportional solenoid is proportional to the pedal position.

The proper conditions for a forward function will be:

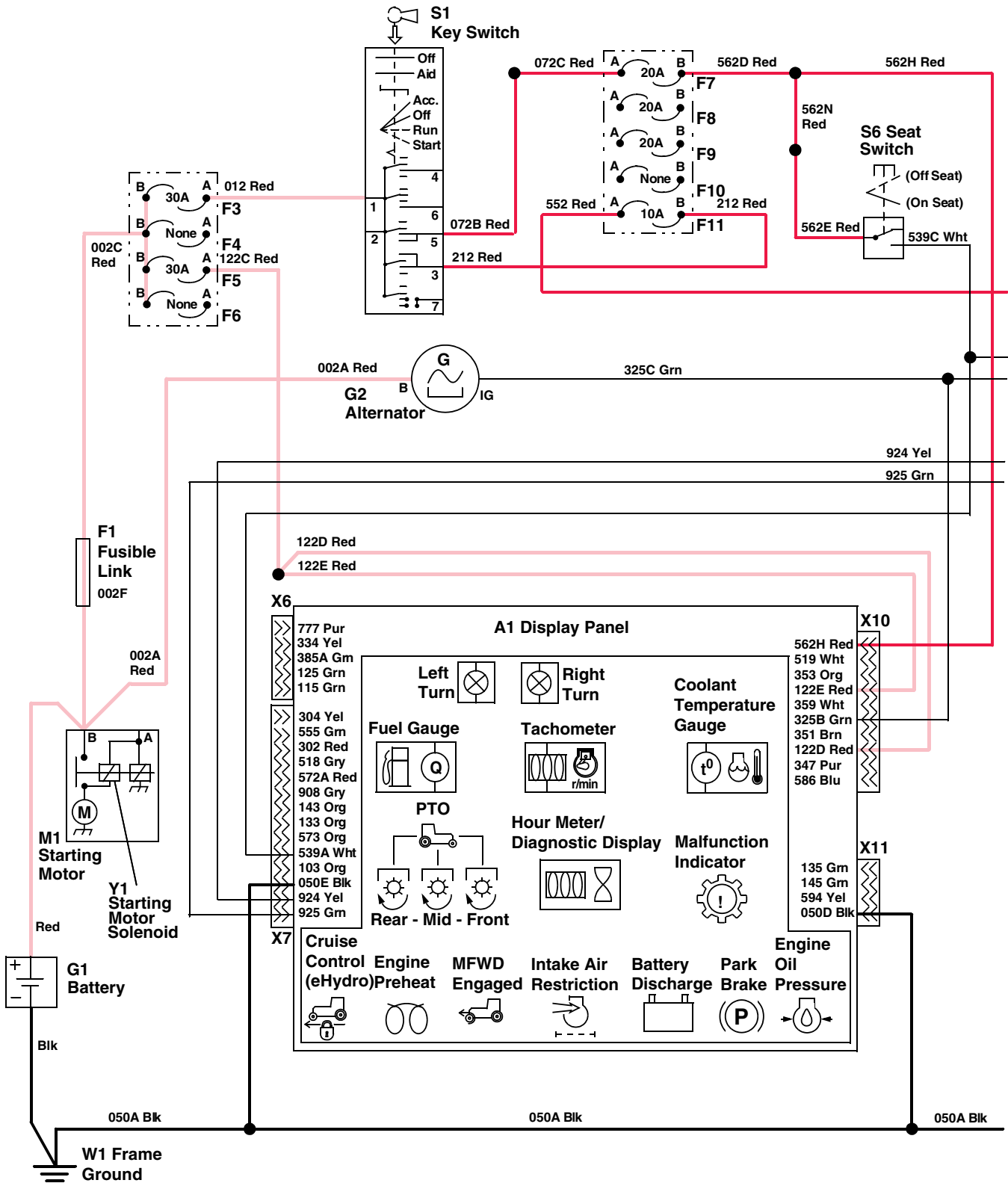
- 12.0 volt input on 552N Red wire, power on,
- 12.0 volt input on wire 539D Wht wire, operator on seat,
- 5.0 volt output on wire 673A Org wire, sensor power,
- Continuity to ground on 550A Blk wire, sensor ground,
- Continuity to ground on 050H Blk wire, drive controller ground,
- Voltage input on the 686 Lt Blu wire, drive pedal pressed,
- Frequency input on the 325D Grn wire, engine speed from the alternator,
- Voltage input on the 499A Wht wire, throttle position sensor,
- Frequency input on the 502A Red wire, MFWD speed sensor,
- Voltage input on the 513 Org wire, FNR switch in the forward position.
- Current output up to 1900 mA on 696A Blu wire, forward proportional solenoid energized, and
- No current output on 697A Pur wire, reverse proportional solenoid not energized.

With the proper commands, the drive controller will ramp the output to the forward proportional solenoid to allow the machine to travel forward at a speed proportional to the position of the drive pedal, based upon the engine rpm and the range gear selected.

If at any time during the drive function that the drive controller detects a problem with any of the input or output commands, the drive controller will provide output current on 924 series Yel wires to the display panel. The LCD on the display panel will then display a fault code. This code can then be matched to the fault code chart to assist in the diagnosis of the problem.

KN52281,100444E -19-02NOV12-1/1

eHydro™—Forward Drive Circuit Electrical Schematic—Pre MY08



LVAL11663 —UN—02NOV10

Continued on next page

KN52281,100444F -19-02NOV12-1/3

A1—Display Panel
F1— Fusible Link
F3— Fuse 30A
F4— Not Used
F5— Fuse 30A
F6— Not Used
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A

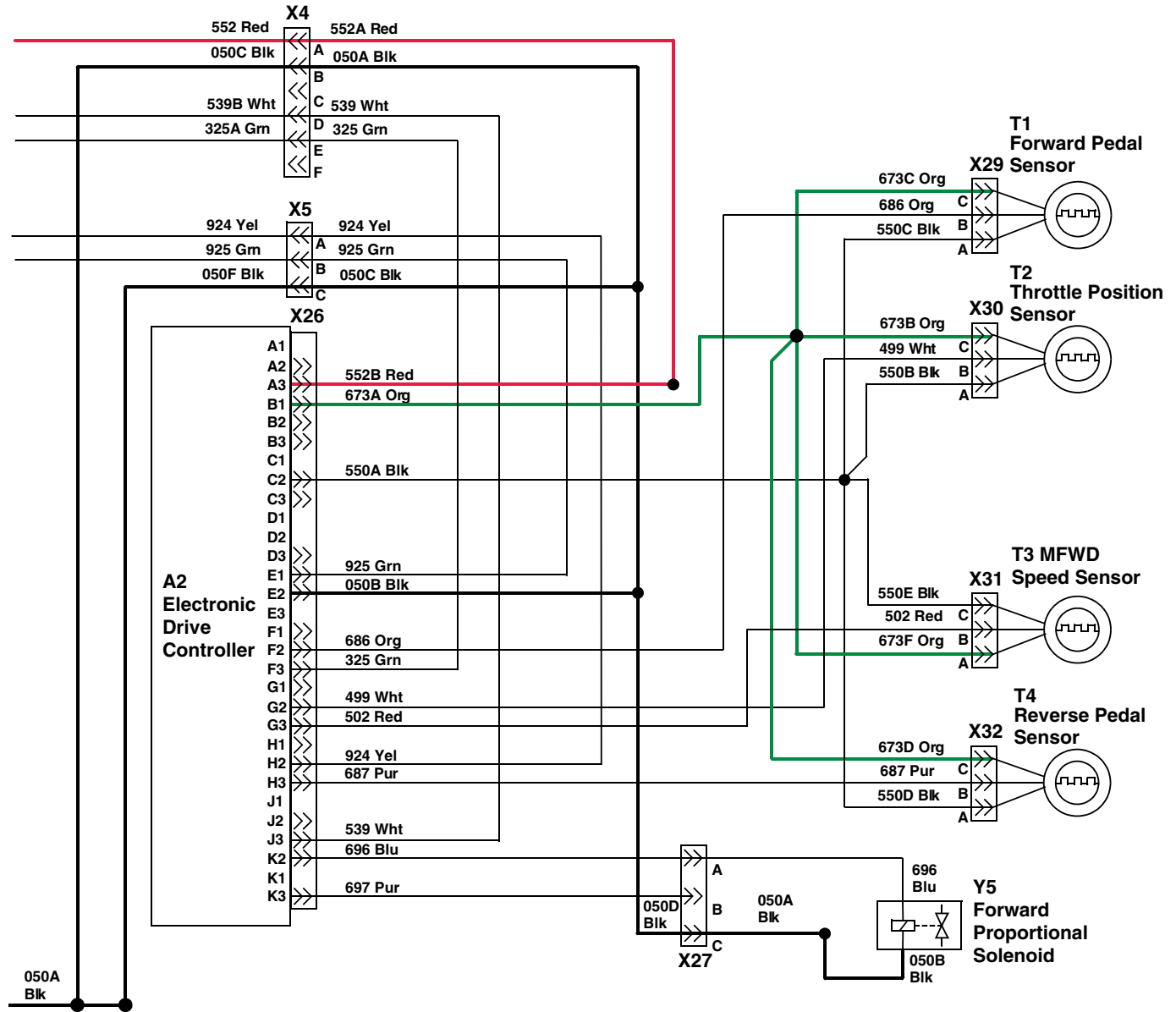
F10— Not Used
F11— Fuse 10A
G1—Battery
G2—Alternator
M1—Starting Motor
S1— Key Switch
S6— Seat Switch
W1—Frame Ground

X6— W1 Main Wiring
Harness-to-A1 Display Panel
X7— W1 Main Wiring
Harness-to-A1 Display Panel
X10— W1 Main Wiring
Harness-to-A1 Display
Panel

X11— W1 Main Wiring
Harness-to-A1 Display
Panel
Y1— Starting Motor Solenoid

Continued on next page

KN52281,100444F -19-02NOV12-2/3



LVAL11664 —UN—02NOV10

A2—Electronic Drive Controller
T1—Forward Pedal Sensor
T2—Throttle Position Sensor
T3—MFWD Speed Sensor
T4—Reverse Pedal Sensor
X4—W1 Main Wiring
Harness-to-W9 eHydro™
Wiring Harness

**X5—W1 Main Wiring
Harness-to-W9 eHydro™
Wiring Harness**

**X26— W9 eHydro™ Wiring
Harness-to-A2 Electronic
Drive Controller**

**X27— W9 eHydro™ Wiring
Harness-to-W10
Proportional Valve Wiring
Harness**

**X29— W9 eHydro™ Wiring
Harness-to-T1 Forward
Pedal Sensor**

**X30— W9 eHydro™ Wiring
Harness-to-T2 Throttle
Position Sensor**

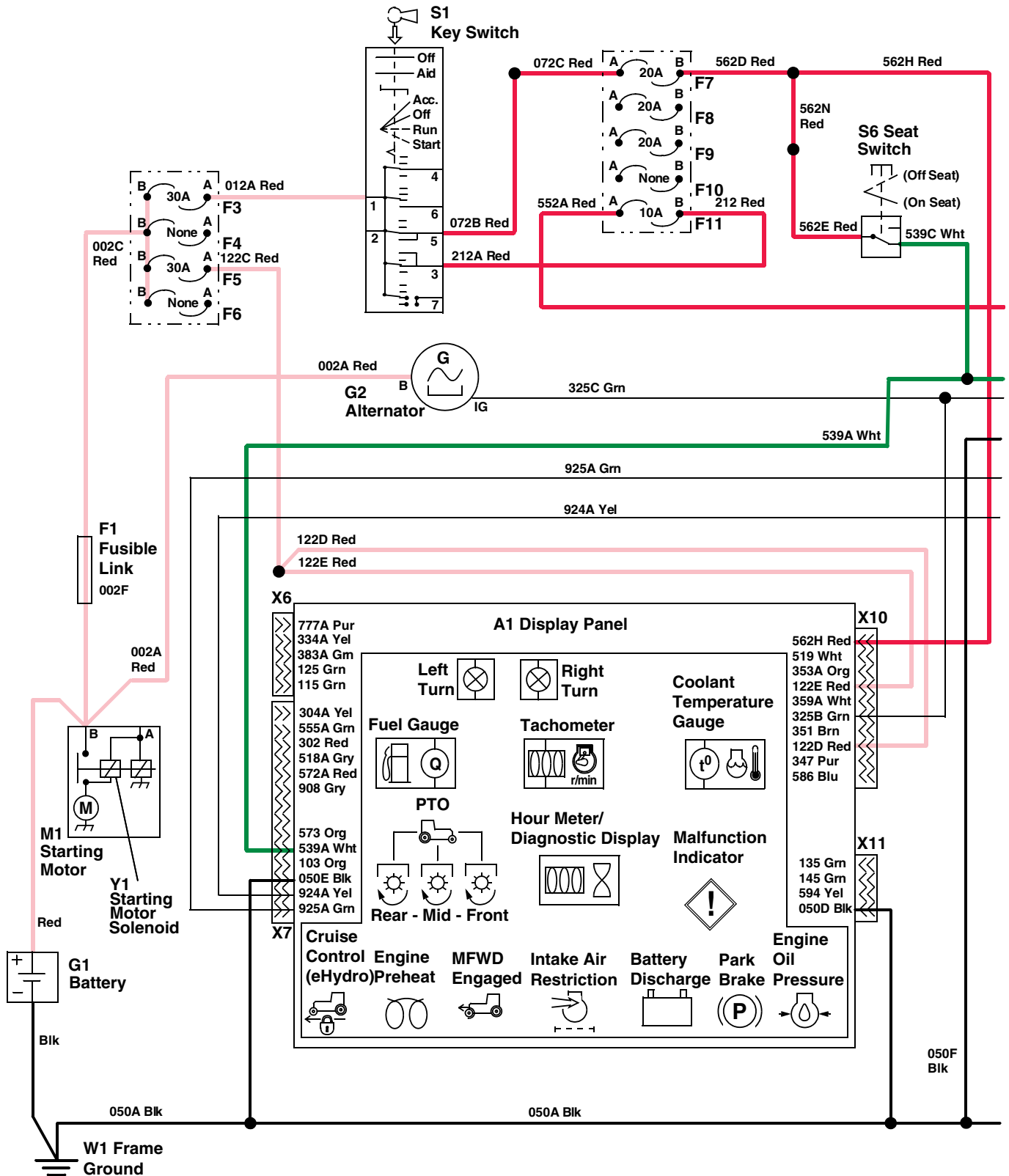
**X31— W9 eHydro™ Wiring
Harness-to-T3 MFWD
Speed Sensor X32 - W9**

**X32— W9 eHydro™ Wiring
Harness-to-T4 Reverse
Pedal Sensor
Y5— Forward Proportional
Solenoid**

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KN52281,100444F -19-02NOV12-3/3

eHydro™/Auto HST—Forward Drive Circuit Electrical Schematic—MY08



LVAL11665 —UN—02NOV10

Continued on next page

KN52281,1004450 -19-02NOV12-1/5

A1—Display Panel
F1— Fusible Link
F3— Fuse 30A
F4— Not Used
F5— Fuse 30A
F6— Not Used
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A

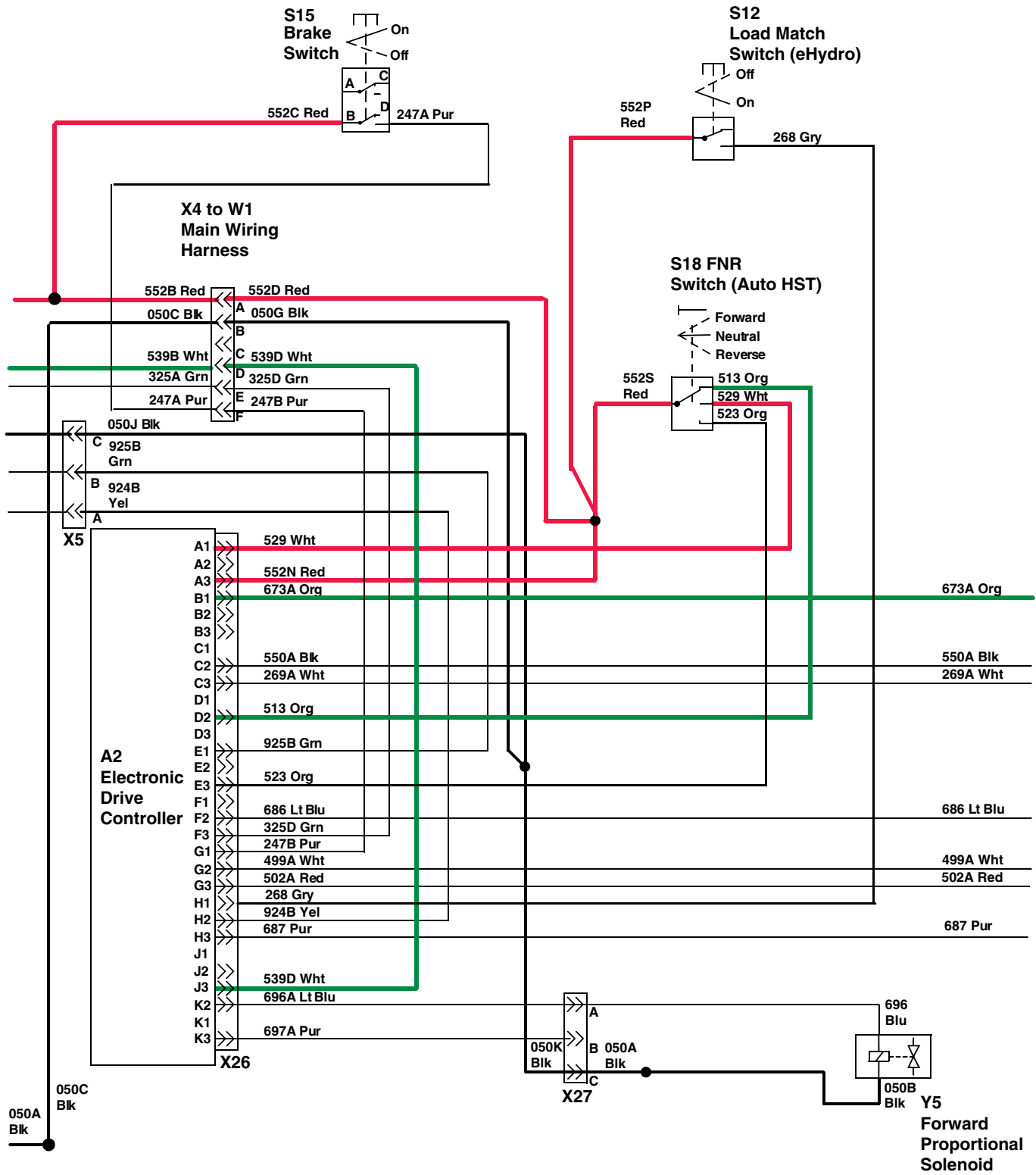
F10— Not Used
F11— Fuse 10A
G1—Battery
G2—Alternator
M1—Starting Motor
S1— Key Switch
S6— Seat Switch
W1—Frame Ground

X6— W1 Main Wiring
Harness-to-A1 Display Panel
X7— W1 Main Wiring
Harness-to-A1 Display Panel
X10— W1 Main Wiring
Harness-to-A1 Display
Panel

X11— W1 Main Wiring
Harness-to-A1 Display
Panel
Y1— Starting Motor Solenoid

Continued on next page

KN52281,1004450 -19-02NOV12-2/5



LVAL11666—UN—02NOV10

Continued on next page

KN52281,1004450 -19-02NOV12-3/5

A2—Electronic Drive Controller
S12— Load Match Switch
 (eHydro™)
S15— Brake Switch

S18— FNR Switch (Auto HST)
X4— W1 Main Wiring
 Harness-to-W9 eHydro™
 Wiring Harness
X5— W1 Main Wiring
 Harness-to-W9 eHydro™
 Wiring Harness

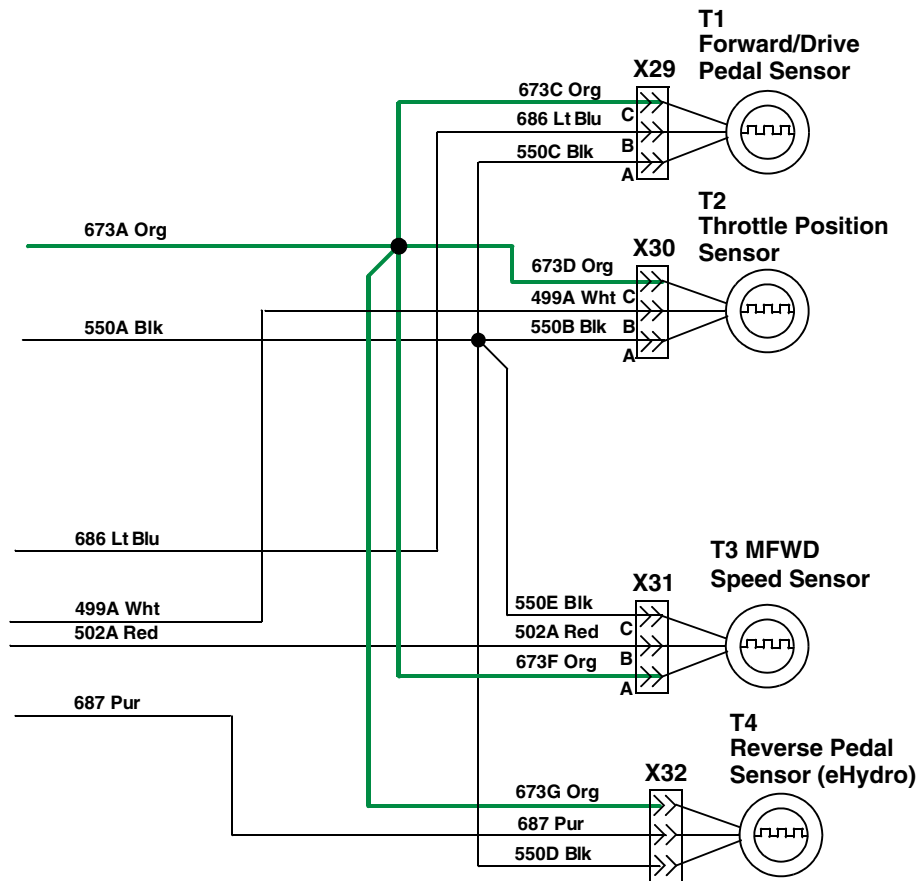
X26— W9 eHydro™ Wiring
 Harness-to-A2 Electronic
 Drive Controller
X27— W9 eHydro™ Wiring
 Harness-to-W10
 Proportional Valve Wiring
 Harness

Y5— Forward Proportional
 Solenoid

eHydro is a trademark of Deere & Company

Continued on next page

KN52281,1004450 -19-02NOV12-4/5



T1— Forward/Drive Pedal Sensor
 T2— Throttle Position Sensor
 T3— MFWD Speed Sensor
 T4— Reverse Pedal Sensor (eHydro™)

X29— W9 eHydro™ Wiring Harness-to-T1 Forward/Drive Pedal Sensor
 X30— W9 eHydro™ Wiring Harness-to-T2 Throttle Position Sensor

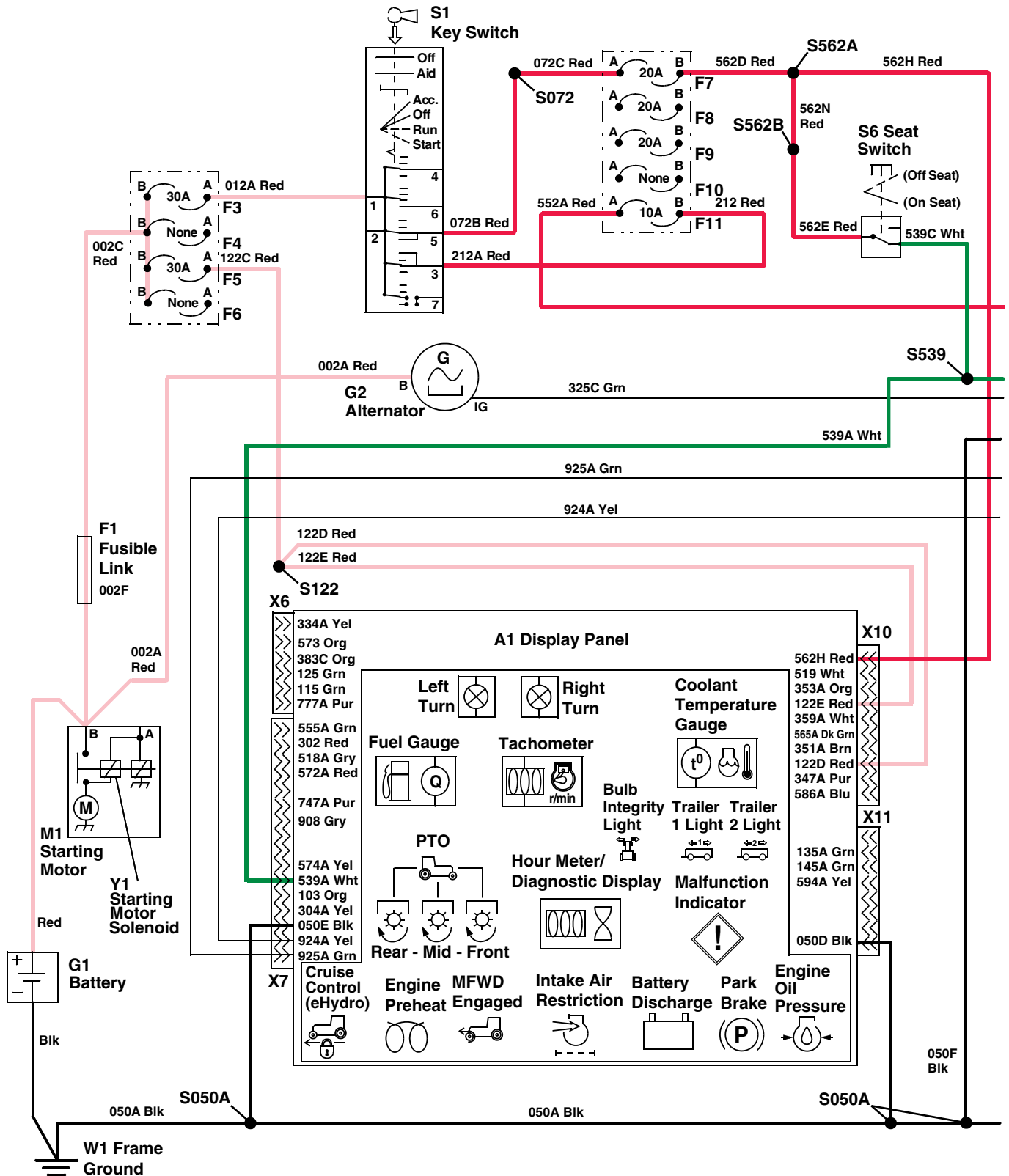
X31— W9 eHydro™ Wiring Harness-to-T3 MFWD Speed Sensor
 X32— W9 eHydro™ Wiring Harness-to-T4 Reverse Pedal Sensor (sensor installed on eHydro™)

eHydro is a trademark of Deere & Company

LVAL11667 —UN—02NOV10

KN52281,1004450 -19-02NOV12-5/5

eHydro™/Auto HST—Forward Drive Circuit Electrical Schematic—MY13



LVAL38735 —UN—05DEC12

Continued on next page

KN52281,1004451 -19-16JAN13-1/5

A1—Display Panel
F1— Fusible Link
F3— Fuse 30A
F4— Not Used
F5— Fuse 30A
F6— Not Used
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A

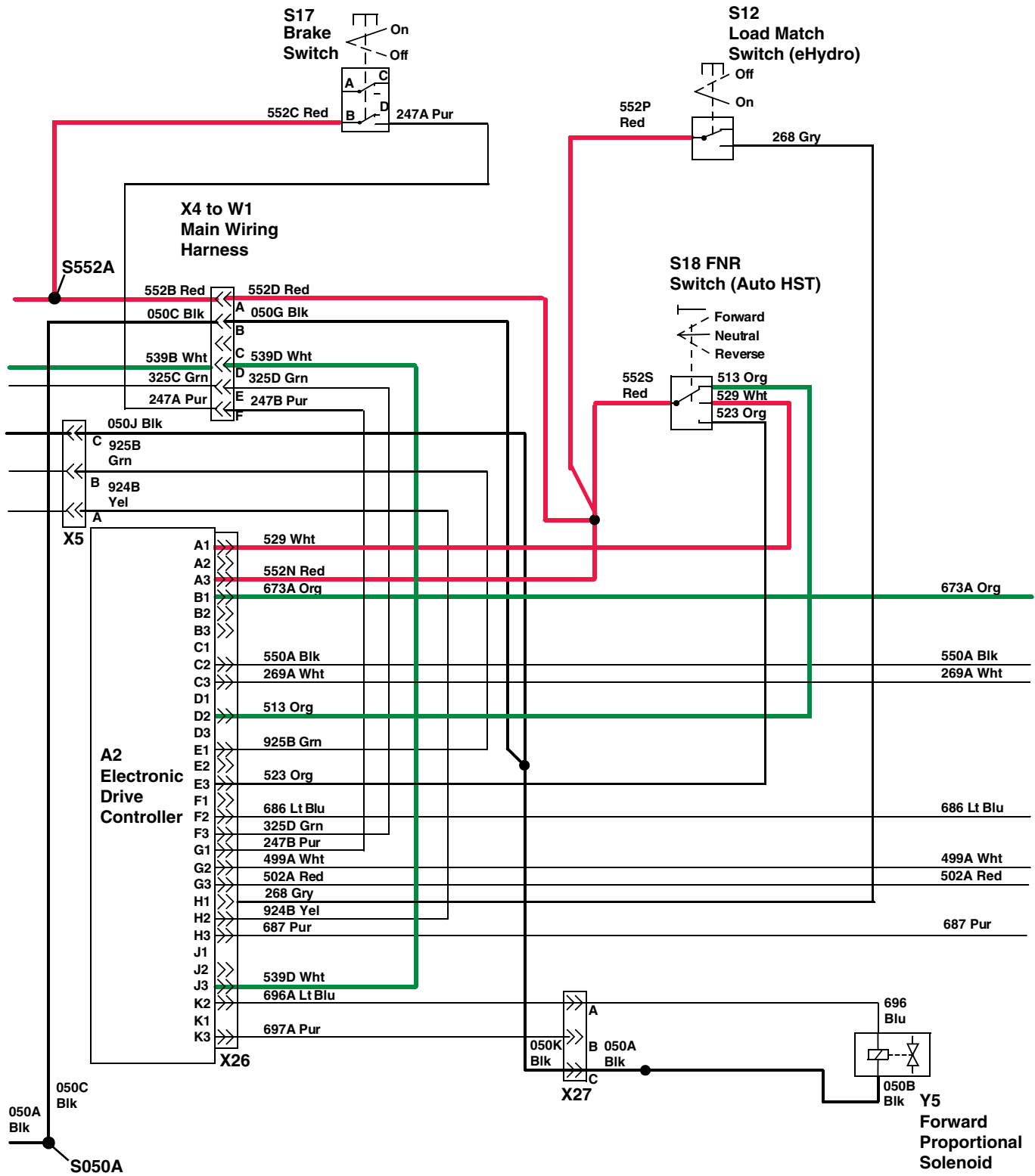
F10— Not Used
F11— Fuse 10A
G1—Battery
G2—Alternator
M1—Starting Motor
S1— Key Switch
S6— Seat Switch
W1—Frame Ground

X6— W1 Main Wiring
Harness-to-A1 Display Panel
X7— W1 Main Wiring
Harness-to-A1 Display Panel
X10— W1 Main Wiring
Harness-to-A1 Display
Panel

X11— W1 Main Wiring
Harness-to-A1 Display
Panel
Y1— Starting Motor Solenoid

Continued on next page

KN52281,1004451 -19-16JAN13-2/5



LVAL38736—UN—09JAN13

Continued on next page

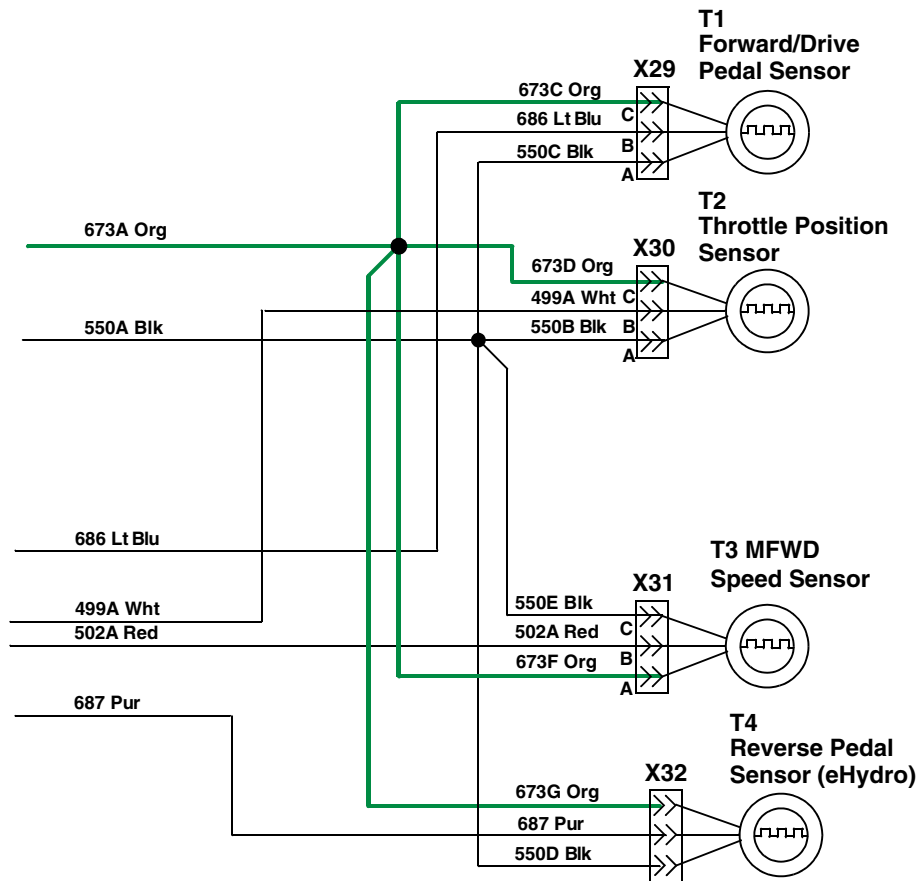
KN52281,1004451 -19-16JAN13-3/5

A2—Electronic Drive Controller	S18— FNR Switch (Auto HST)	X26— W9 eHydro™/Auto HST	Y5— Forward Proportional
S12— Load Match Switch	X4— W1 Main Wiring Harness-	Wiring Harness-to-A2	Solenoid
(eHydro™)	to-W9 eHydro™/Auto HST	Electronic Drive Controller	
S15— Brake Switch	Wiring Harness	X27— W9 eHydro™/Auto HST	
	X5— W1 Main Wiring Harness-	Wiring Harness-to-W10	
	to-W9 eHydro™/Auto HST	Proportional Valve Wiring	
	Wiring Harness	Harness	

eHydro is a trademark of Deere & Company

Continued on next page

KN52281,1004451 -19-16JAN13-4/5



- | | | |
|--------------------------------|--------------------------|--------------------------|
| T1— Forward/Drive Pedal Sensor | X29— W9 eHydro™/Auto HST | X31— W9 eHydro™/Auto HST |
| T2— Throttle Position Sensor | Wiring Harness-to-T1 | Wiring Harness-to-T3 |
| T3— MFWD Speed Sensor | Forward/Drive Pedal | MFWD Speed Sensor |
| T4— Reverse Pedal Sensor | Sensor | |
| (eHydro™ only) | X30— W9 eHydro™/Auto HST | X32— W9 eHydro™/Auto HST |
| | Wiring Harness-to-T2 | Wiring Harness-to-T4 |
| | Throttle Position Sensor | Reverse Pedal Sensor |
| | | (eHydro™ only) |

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LVAL11667 —UN—02NOV10

KN52281,1004451 -19-16JAN13-5/5

eHydro™—Forward Drive Circuit Diagnosis—Pre MY08

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on eHydro™ models. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.), and specifically see Diagnostic

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Mode 2 (eHydro™/Auto HST). The diagnostic mode will provide a reading of current drive component operating values such as voltage, current, or frequency.

KN52281,1004452 -19-02NOV12-1/8

Break-out Box.....JDG1575 Test Kit

Test the electrical circuits of the electronic drive controller.

KN52281,1004452 -19-02NOV12-2/8

Test Procedure A

Test Conditions:

- Park brake locked.

- Operator on seat.
- Drive pedals released.
- Key switch in run position, engine not running.

KN52281,1004452 -19-02NOV12-3/8

Forward Drive Circuit

KN52281,1004452 -19-02NOV12-4/8

Step 1

Do any fault codes appear in the LCD display?

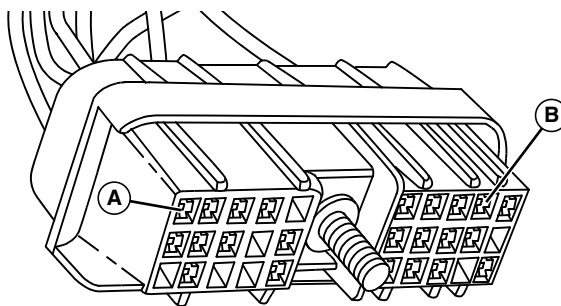
YES: Correct the possible faults. (See [Display Panel Fault Codes—Auto HST/eHydro™](#) in Section 40, Group 45.

NO: Go to next step.

Continued on next page

KN52281,1004452 -19-02NOV12-5/8

Step 2



LVAL11668 —UN—02NOV10

A—X26 Drive Controller Connector Terminals A3, 552B Red Wire

B—X26 Drive Controller Connector Terminals J3, 539 Wht Wire

Disconnect the X26 connector to the drive controller. Is battery voltage present at terminals A3, 552B Red wire (A) and J3 539 Wht wire (B)?

YES: Connect the X26 connector to the drive controller. Go to next step.

NO: 552B Red wire. Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

NO: 539 Wht wire. Test seat switch. Check 539C, 539B and 539 Wht wires and connections. Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

KN52281,1004452 -19-02NOV12-6/8

Step 3

Test the forward pedal sensor. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.), and/or (See [eHydro™—Forward and Reverse Pedal Sensor Test and Adjustment](#) in Section 40, Group 50.) Does the pedal sensor measure within specification?

YES: Go to next step.

NO: Adjust, repair, or replace components as directed in the pedal sensor test.

KN52281,1004452 -19-02NOV12-7/8

Step 4

Test the forward proportional solenoid coil. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.) Does the solenoid coil measure within specification?

YES: Electrical test complete. Test the hydrostatic power train. (See [Troubleshooting](#) in Section 70, Group 30.) of the Power Train—Hydrostatic section.

NO: Adjust, repair, or replace components as directed in the proportional solenoid coil test.

KN52281,1004452 -19-02NOV12-8/8

eHydro™—Forward Drive Circuit Diagnosis—MY08

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on eHydro™

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models. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.), and see Diagnostic Mode 2 (eHydro™/Auto HST). The diagnostic mode will provide a reading of current drive component operating values such as voltage, current, or frequency.

KN52281,1004453 -19-02NOV12-1/8

Break-out Box.....JDG1575 Test Kit

Test the electrical circuits of the electronic drive controller.

KN52281,1004453 -19-02NOV12-2/8

Test Procedure A

Test Conditions:

- Park brake locked.

- Operator on seat.
- Drive pedals released.
- Key switch in run position, engine not running.

KN52281,1004453 -19-02NOV12-3/8

Forward Drive Circuit

KN52281,1004453 -19-02NOV12-4/8

Step 1

Do any fault codes appear in the LCD display?

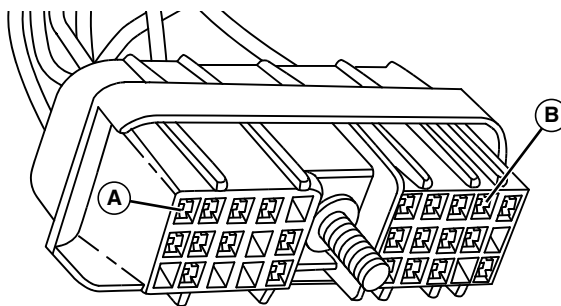
YES: Correct the possible faults. (See [Display Panel Fault Codes—Auto HST/eHydro™](#) in Section 40, Group 45.)

NO: Go to next step.

Continued on next page

KN52281,1004453 -19-02NOV12-5/8

Step 2



LVAL11669 —UN—02NOV10

A—X26 Drive Controller Connector Terminals A3, 552N Red Wire

B—X26 Drive Controller Connector Terminals J3, 539D Red Wire

Disconnect the X26 connector to the drive controller. Is battery voltage present at terminals A3, 552N Red wire (A) and J3 539D Wht wire (B)?

YES: Connect the X26 connector to the drive controller. Go to next step.

NO: 552N Red wire.

Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

NO: 539D Wht wire. Test seat switch. Check 539D, 539B, 539C and 539A Wht wires and connections.

Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

NO: Test the S6 seat switch. (See [Seat Switch Test](#) in Section 40, Group 40.)

KN52281,1004453 -19-02NOV12-6/8

Step 3

Test the forward pedal sensor. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.), and/or (See [eHydro™—Forward and Reverse Pedal Sensor Test and Adjustment](#) in Section 40, Group 50.) Does the pedal sensor measure within specification?

YES: Go to next step.

NO: Adjust, repair, or replace components as directed in the pedal sensor test.

KN52281,1004453 -19-02NOV12-7/8

Step 4

Test the forward proportional solenoid coil. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.) Does the solenoid coil measure within specification?

YES: Electrical test complete. Test the hydrostatic power train. (See [Troubleshooting](#) in Section 70, Group 30.) of the Power Train—Hydrostatic section.

NO: Adjust, repair, or replace components as directed in the proportional solenoid coil test.

KN52281,1004453 -19-02NOV12-8/8

eHydro™—Forward Drive Circuit Diagnosis—MY13

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on eHydro™

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models. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 50.), and see Diagnostic Mode 2 (eHydro™/Auto HST). The diagnostic mode will provide a reading of current drive component operating values such as voltage, current, or frequency.

KN52281,1004454 -19-21JAN13-1/8

Break-out Box.....JDG1575 Test Kit

Test the electrical circuits of the electronic drive controller.

KN52281,1004454 -19-21JAN13-2/8

Test Procedure A

Test Conditions

- Park brake locked.

- Operator on seat.
- Drive pedals released.
- Key switch in run position, engine not running.

KN52281,1004454 -19-21JAN13-3/8

Forward Drive Circuit

KN52281,1004454 -19-21JAN13-4/8

Step 1

Do any fault codes appear in the LCD display?

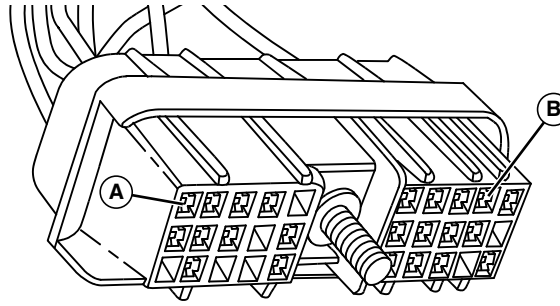
YES: Correct the possible faults. (See [Display Panel Fault Codes—Auto HST/eHydro™](#) in Section 40, Group 50.)

NO: Go to next step.

Continued on next page

KN52281,1004454 -19-21JAN13-5/8

Step 2



LVAL11669 —UN—02NOV10

A—X26 Drive Controller Connector Terminals A3, 552N Red Wire

B—X26 Drive Controller Connector Terminals J3, 539D White Wire

Disconnect the X26 connector to the drive controller. Is battery voltage present at terminals A3, 552N Red wire (A) and J3 539D Wht wire (B)?

YES: Connect the X26 connector to the drive controller. Go to next step.

NO: 552N Red wire. Test the switched power circuit. (See [Power Circuit Diagnosis—MY13—NA](#) in Section 40, Group 40.)

NO: 539D Wht wire. Test seat switch. Check 539D, 539B, 539C and 539A Wht wires and connections. Test the switched power circuit.(See [Power Circuit Diagnosis—MY13—NA](#) in Section 40, Group 40.)

NO: Test the S6 seat switch. (See [Seat Switch Test](#) in Section 40, Group 45.)

KN52281,1004454 -19-21JAN13-6/8

Step 3

Test the forward pedal sensor. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 50.), and/or (See [eHydro™—Forward and Reverse Pedal Sensor Test and Adjustment](#) in Section 40, Group 55.)

Does the pedal sensor measure within specification?

Drive Pedal—Specification

Input—Voltage.....	5.0 ± 0.2 V
Released Position Signal—Voltage.....	0.6—0.9 V
Pressed Position Signal—Voltage.....	2.7—3.5 V
	greater than released signal voltage
Lock Nut—Torque.....	5 N•m (44.25 lb-in.)

YES: Go to next step.

NO: Adjust, repair, or replace components as directed in the pedal sensor test.

KN52281,1004454 -19-21JAN13-7/8

Step 4

Test the forward proportional solenoid coil. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 50.) Does the solenoid coil measure within specification?

YES: Electrical test complete. Test the hydrostatic power train. [See [Troubleshooting](#) in Section 70, Group 30 (Power Train—Hydrostatic)].

NO: Adjust, repair, or replace components as directed in the proportional solenoid coil test.

KN52281,1004454 -19-21JAN13-8/8

Auto HST—Forward Drive Circuit Diagnosis—MY08

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on Auto HST

models. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.), and see Diagnostic Mode 2 (eHydro™/Auto HST). The diagnostic mode will provide a reading of current drive component operating values such as voltage, current, or frequency.

KN52281,1004455 -19-02NOV12-1/9

Break-out Box.....JDG1575 Test Kit

Test the electrical circuits of the electronic drive controller.

KN52281,1004455 -19-02NOV12-2/9

Test Procedure A

Test Conditions:

- Park brake locked.

- Operator on seat.
- Drive pedal released.
- Key switch in run position, engine not running.
- FNR switch in forward position.

KN52281,1004455 -19-02NOV12-3/9

Forward Drive Circuit

KN52281,1004455 -19-02NOV12-4/9

Step 1

Do any fault codes appear in the LCD display?

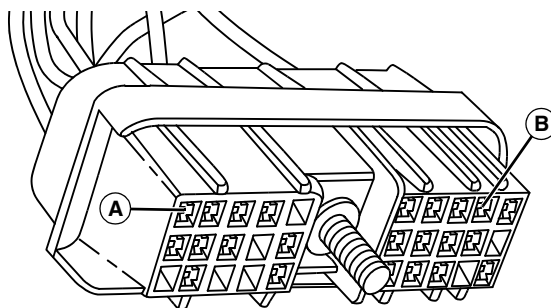
YES: Correct the possible faults. (See [Display Panel Fault Codes—Auto HST/eHydro™](#) in Section 40, Group 45.)

NO: Go to next step.

Continued on next page

KN52281,1004455 -19-02NOV12-5/9

Step 2



LVAL11670 —UN—02NOV10

A—X26 Drive Controller Connector Terminals A3, 552N Red Wire

B—X26 Drive Controller Connector Terminals J3, 539D Wht Wire

Disconnect the X26 connector to the drive controller. Is battery voltage present at terminals A3, 552N Red wire (A) and J3 539D Wht wire (B)?

YES: Connect the X26 connector to the drive controller. Go to next step.

NO: 552N Red wire:
Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

NO: 539D Wht wire: Test seat switch. Check 539D, 539B, 539C, and 539A Wht wires and connections. Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

NO: Test S6 seat switch. (See [Seat Switch Test](#) in Section 40, Group 40.)

KN52281,1004455 -19-02NOV12-6/9

Step 3

Is battery voltage present at A2 drive controller, 513 Org wire?

YES: Go to next step.

NO: Test related switched power circuits.

NO: Test S18 FNR switch. (See [FNR Switch Test—Auto HST](#) in Section 40, Group 40.)

NO: Check 513 Org wire and connections.

KN52281,1004455 -19-02NOV12-7/9

Step 4

Test the drive pedal sensor. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.), and/or (see [Auto HST—Drive Pedal Sensor Test and Adjustment](#) in Section 40, Group 50.) Does the drive pedal sensor measure within specification?

YES: Go to next step.

NO: Adjust, repair, or replace components as directed in the pedal sensor test.

Continued on next page

KN52281,1004455 -19-02NOV12-8/9

Step 5

Test the forward proportional solenoid coil. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.) or (see [Proportional Drive Solenoid Test—eHydro™/Auto HST](#) in Section 40, Group 40.) Does the solenoid coil measure within specification?

YES: Electrical test complete. Test the hydrostatic power train. (See [Troubleshooting](#) in Section 70, Group 30.) of the Power Train—Hydrostatic section.
NO: Adjust, repair, or replace components as directed in the proportional solenoid coil test.

KN52281,1004455 -19-02NOV12-9/9

Auto HST—Forward Drive Circuit Diagnosis—MY13

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on Auto HST

models. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 50.), and see Diagnostic Mode 2 (eHydro™/Auto HST). The diagnostic mode will provide a reading of current drive component operating values such as voltage, current, or frequency.

KN52281,1004456 -19-21JAN13-1/9

Break-out Box.....JDG1575 Test Kit

Test the electrical circuits of the electronic drive controller.

KN52281,1004456 -19-21JAN13-2/9

Test Procedure A

Test Conditions

- Park brake locked.

- Operator on seat.
- Drive pedal released.
- Key switch in run position, engine not running.
- FNR switch in forward position.

KN52281,1004456 -19-21JAN13-3/9

Forward Drive Circuit

KN52281,1004456 -19-21JAN13-4/9

Step 1

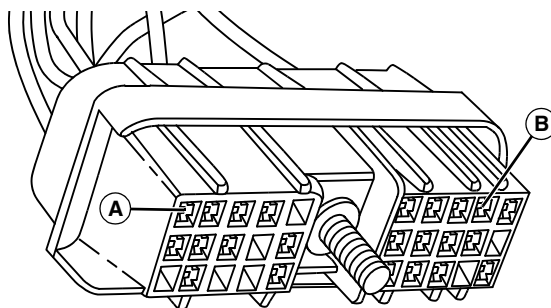
Do any fault codes appear in the LCD display?

YES: Correct the possible faults. (See [Display Panel Fault Codes—Auto HST/eHydro™](#) in Section 40, Group 50.)
NO: Go to next step.

Continued on next page

KN52281,1004456 -19-21JAN13-5/9

Step 2



LVAL11670 —UN—02NOV10

A—X26 Drive Controller Connector Terminals A3, 552N Red Wire

B—X26 Drive Controller Connector Terminals J3, 539D Wht Wire

Disconnect the X26 connector to the drive controller. Is battery voltage present at terminals A3, 552N Red wire (A) and J3 539D Wht wire (B)?

YES: Connect the X26 connector to the drive controller. Go to next step.

NO: 552N Red wire:
Test the switched power circuit. (See [Power Circuit Diagnosis—MY13—NA](#) in Section 40, Group 40.)

NO: 539D Wht wire: Test seat switch. Check 539D, 539B, 539C, and 539A Wht wires and connections. Test the switched power circuit. (See [Power Circuit Diagnosis—MY13—NA](#) in Section 40, Group 40.)

NO: Test S6 seat switch. (See [Seat Switch Test](#) in Section 40, Group 45.)

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Step 3

Is battery voltage present at A2 drive controller, 513 Org wire?

YES: Go to next step.

NO: Test related switched power circuits.

NO: Test S18 FNR switch. (See [FNR Switch Test—Auto HST](#) in Section 40, Group 45.)

NO: Check 513 Org wire and connections.

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Step 4

Test the drive pedal sensor. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 50.), and/or (see [Auto HST—Drive Pedal Sensor Test and Adjustment](#) in Section 40, Group 55.)

Does the drive pedal sensor measure within specification?

YES: Go to next step.

NO: Adjust, repair, or replace components as directed in the pedal sensor test.

Continued on next page

KN52281,1004456 -19-21JAN13-8/9

Step 5

Test the forward proportional solenoid coil. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 50.) or (See [Proportional Drive Solenoid Test—eHydro™/Auto HST](#) in Section 40, Group 45.)

Does the solenoid coil measure within specification?

YES: Electrical test complete. Test the hydrostatic power train. [See [Troubleshooting](#) in Section 70, Group 30 (Power Train—Hydrostatic)].

NO: Adjust, repair, or replace components as directed in the proportional solenoid coil test.

KN52281,1004456 -19-21JAN13-9/9

eHydro™—Reverse Drive Circuit Operation—Pre MY08

Function:

The reverse drive circuit causes the electronic drive controller to propel the machine in a controlled reverse direction.

Additionally the electronic drive controller provides for setting the following functions during a reverse drive:

- Maximum travel speed,
- Motion match (pedal responsiveness), and
- Load match.

Each of these additional functions has the ability to be turned on or off by the operator.

Operating Conditions:

- Key switch in run position,
- Engine running,
- Operator on seat, and
- Park brake unlocked.
- Reverse pedal depressed.

Theory of Operation:

The electronic drive controller (drive controller) is a preprogramming electrical device that allows the operator to control the machine reverse drive function and speed via the electrical inputs from the reverse foot pedal. Under normal operating conditions, this creates an output to the reverse proportional solenoid in the transmission.

Current is supplied to the A2 drive controller from the switched power circuit.

With the key switch in the run or accessories position, current is supplied to the 212 Red wire, F11 fuse, 552 Red wire, X4 connector to the W9 wiring harness to the 552A and 552B Red wires and the A3 terminal of the X26 connector and the drive controller. This power supply is turned off when the key switch is in the start position.

These circuits power the drive controller to allow for drive control operation. The 673A Org wire splices to the 673B, 673C, 673D, 673E, and 673G Org wires to provide current from the drive controller to the throttle position sensor,

forward pedal sensor, reverse pedal sensor, motion match switch (optional), and the MFWD speed sensor respectively.

When the reverse pedal is pressed, the reverse pedal sensor rotates and sends voltage back to the drive controller through the 687 Pur wire. The drive controller then processes the voltage from this input command into an output command if the proper operating conditions exist. The output command (current) to the reverse proportional solenoid is proportional to the pedal position.

The proper conditions for a reverse function will be:

- 12.0 volt input on wire 552B Red wire, power on,
- 12.0 volt input on wire 539 Wht wire, operator on seat,
- 5.0 volt output on wire 673A Org wire, sensor power,
- Continuity to ground on 550A Blk wire, sensor ground,
- Continuity to ground on 050B Blk wire, drive controller ground,
- Voltage input on the 687 Pur wire, reverse pedal pressed,
- Frequency input on the 325 Grn wire, engine speed from the alternator,
- Voltage input on the 499 Wht wire, throttle position sensor,
- Frequency input on the 502 Red wire, MFWD speed sensor,
- Voltage input on the 686 Lt Blu wire, forward pedal not pressed,
- Current output up to 1900mA on 697 Pur wire, reverse proportional solenoid energized, and
- No current output on 696 Blu wire, forward proportional solenoid not energized.

With the proper commands, the drive controller will ramp the output to the reverse proportional solenoid to allow the machine to travel reverse at a speed proportional to the position of the reverse pedal, based upon the engine rpm and the range gear selected.

If at any time during the drive function the drive controller detects a problem with any of the input or output commands, the drive controller will provide output current on wire 924 Yel to the display panel. The LCD on the display panel will then display a fault code. This code can then be matched to the fault code chart to assist in the diagnosis of the problem.

KN52281,1004457 -19-02NOV12-1/1

eHydro™—Reverse Drive Circuit Operation—MY08

Function:

The reverse drive circuit causes the electronic drive controller to propel the machine in a controlled reverse direction.

Additionally the electronic drive controller provides for setting the following functions during a reverse drive:

- Maximum travel speed,
- Motion match (pedal responsiveness), and
- Load match.

Each of these additional functions has the ability to be turned on or off by the operator.

Operating Conditions:

- Key switch in run position,
- Engine running,
- Operator on seat, and
- Park brake unlocked.
- Reverse pedal depressed.

Theory of Operation:

The electronic drive controller (drive controller) is a preprogramming electrical device that allows the operator to control the machine reverse drive function and speed via the electrical inputs from the reverse foot pedal. Under normal operating conditions, this creates an output to the reverse proportional solenoid in the transmission.

Current is supplied to the A2 drive controller from the switched power circuit.

With the key switch in the run or accessories position, current is supplied to the 212A Red wire, F11 fuse, 552 series Red wires, X4 connector to the W9 wiring harness to the 552D and 552N Red wires and the A3 terminal of the X26 connector and the drive controller. This power supply is turned off when the key switch is in the start position.

These circuits power the drive controller to allow for drive control operation. The 673A Org wire splices to the 673B, 673C, 673D, 673E, and 67F Org wires to provide current from the drive controller to the throttle position sensor,

forward pedal sensor, reverse pedal sensor, motion match switch (optional), and the MFWD speed sensor respectively.

When the reverse pedal is pressed, the reverse pedal sensor rotates and sends voltage back to the drive controller through the 687 Pur wire. The drive controller then processes the voltage from this input command into an output command if the proper operating conditions exist. The output command (current) to the reverse proportional solenoid is proportional to the pedal position.

The proper conditions for a reverse function will be:

- 12.0 volt input on wire 552N Red wire, power on,
- 12.0 volt input on wire 53D9 Wht wire, operator on seat,
- 5.0 volt output on wire 673A Org wire, sensor power,
- Continuity to ground on 550A Blk wire, sensor ground,
- Continuity to ground on 050B Blk wire, drive controller ground,
- Voltage input on the 687 Pur wire, reverse pedal pressed,
- Frequency input on the 325A Grn wire, engine speed from the alternator,
- Voltage input on the 499A Wht wire, throttle position sensor,
- Frequency input on the 502A Red wire, MFWD speed sensor,
- Voltage input on the 686 Lt Blu wire, forward pedal not pressed,
- Current output up to 1900mA on 697 Pur wire, reverse proportional solenoid energized, and
- No current output on 696 Blu wire, forward proportional solenoid not energized.

With the proper commands, the drive controller will ramp the output to the reverse proportional solenoid to allow the machine to travel reverse at a speed proportional to the position of the reverse pedal, based upon the engine rpm and the range gear selected.

If at any time during the drive function the drive controller detects a problem with any of the input or output commands, the drive controller will provide output current on wire 924 Yel to the display panel. The LCD on the display panel will then display a fault code. This code can then be matched to the fault code chart to assist in the diagnosis of the problem.

KN52281,1004458 -19-02NOV12-1/1

eHydro™—Reverse Drive Circuit Operation—MY13

Function

The reverse drive circuit causes the electronic drive controller to propel the machine in a controlled reverse direction.

Additionally the electronic drive controller provides for setting the following functions during a reverse drive:

- Maximum travel speed,
- Motion match (pedal responsiveness), and
- Load match.

Each of these additional functions has the ability to be turned on or off by the operator.

Operating Conditions

- Key switch in run position,
- Engine running,
- Operator on seat, and
- Park brake unlocked.
- Reverse pedal depressed.

Theory of Operation

The electronic drive controller (drive controller) is a preprogramming electrical device that allows the operator to control the machine reverse drive function and speed via the electrical inputs from the reverse foot pedal. Under normal operating conditions, this creates an output to the reverse proportional solenoid in the transmission.

Current is supplied to the A2 drive controller from the switched power circuit.

With the key switch in the run or accessories position, current is supplied to the 212A Red wire, F11 fuse, 552 series Red wires, X4 connector to the W9 wiring harness to the 552D and 552N Red wires and the A3 terminal of the X26 connector and the drive controller. This power supply is turned off when the key switch is in the start position.

These circuits power the drive controller to allow for drive control operation. The 673A Org wire splices to the 673B, 673C, 673D, 673E, and 67F Org wires to provide current from the drive controller to the throttle position sensor,

forward pedal sensor, reverse pedal sensor, motion match switch (optional), and the MFWD speed sensor respectively.

When the reverse pedal is pressed, the reverse pedal sensor rotates and sends voltage back to the drive controller through the 687 Pur wire. The drive controller then processes the voltage from this input command into an output command if the proper operating conditions exist. The output command (current) to the reverse proportional solenoid is proportional to the pedal position.

The proper conditions for a reverse function will be:

- 12.0 volt input on wire 552N Red wire, power on,
- 12.0 volt input on wire 53D9 Wht wire, operator on seat,
- 5.0 volt output on wire 673A Org wire, sensor power,
- Continuity to ground on 550A Blk wire, sensor ground,
- Continuity to ground on 050H Blk wire, drive controller ground,
- Voltage input on the 687 Pur wire, reverse pedal pressed,
- Frequency input on the 325D Grn wire, engine speed from the alternator,
- Voltage input on the 499A Wht wire, throttle position sensor,
- Frequency input on the 502A Red wire, MFWD speed sensor,
- Voltage input on the 686 Lt Blu wire, forward pedal not pressed,
- Current output up to 1900mA on 697 Pur wire, reverse proportional solenoid energized, and
- No current output on 696 Blu wire, forward proportional solenoid not energized.

With the proper commands, the drive controller will ramp the output to the reverse proportional solenoid to allow the machine to travel reverse at a speed proportional to the position of the reverse pedal, based upon the engine rpm and the range gear selected.

If at any time during the drive function the drive controller detects a problem with any of the input or output commands, the drive controller will provide output current on wire 924 Yel to the display panel. The LCD on the display panel will then display a fault code. This code can then be matched to the fault code chart to assist in the diagnosis of the problem.

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Auto HST—Reverse Drive Circuit Operation

Function:

The reverse drive circuit causes the electronic drive controller to propel the machine in a controlled reverse direction.

Additionally the electronic drive controller provides for setting the following functions during a reverse drive:

- Maximum travel speed,
- Motion match (pedal responsiveness), and

Each of these additional functions has the ability to be turned on or off by the operator.

Operating Conditions:

- Key switch in run position,
- Engine running,
- Operator on seat, and
- Park brake unlocked.
- FNR switch in reverse position
- Drive pedal depressed.

Theory of Operation:

The electronic drive controller (drive controller) is a preprogramming electrical device that allows the operator to control the machine reverse drive function and speed via the electrical inputs from the drive foot pedal and the FNR switch. Under normal operating conditions, this creates an output to the reverse proportional solenoid in the transmission.

Current is supplied to the A2 drive controller from the switched power circuit.

With the key switch in the run or accessories position, current is supplied to the 212A Red wire, F11 fuse, 552 series Red wires, X4 connector to the W9 wiring harness to the 552 series Red wires and the A3 terminal of the X26 connector and the drive controller. This power supply is turned off when the key switch is in the start position.

These circuits power the drive controller to allow for drive control operation. The 673A Org wire splices to the 673D, 673C, 673D, 673, and 673F Org wires to provide current

from the drive controller to the throttle position sensor, drive pedal sensor, motion match switch (optional), and the MFWD speed sensor respectively.

When the drive pedal is pressed, the drive pedal sensor rotates and sends voltage back to the drive controller through the 686 Lt Blu wire. The drive controller then processes the voltage from this input command into an output command if the proper operating conditions exist. The output command (current) to the reverse proportional solenoid is proportional to the pedal position.

The proper conditions for a reverse function will be:

- 12.0 volt input on wire 552N Red wire, power on,
- 12.0 volt input on wire 539D Wht wire, operator on seat,
- 5.0 volt output on wire 673A Org wire, sensor power,
- Continuity to ground on 550A Blk wire, sensor ground,
- Continuity to ground on 050B Blk wire, drive controller ground,
- Voltage input on the 667 Lt Blu wire, drive pedal pressed,
- Frequency input on the 325D Grn wire, engine speed from the alternator,
- Voltage input on the 499A Wht wire, throttle position sensor,
- Frequency input on the 502A Red wire, MFWD speed sensor,
- Voltage input on the 523 Org wire, FNR switch in the reverse position.
- Current output up to 1900mA on 697A Pur wire, reverse proportional solenoid energized, and
- No current output on 696A Blu wire, forward proportional solenoid not energized.

With the proper commands, the drive controller will ramp the output to the reverse proportional solenoid to allow the machine to travel reverse at a speed proportional to the position of the drive pedal, based upon the engine rpm and the range gear selected.

If at any time during the drive function the drive controller detects a problem with any of the input or output commands, the drive controller will provide output current on the 924 series Yel wires to the display panel. The LCD on the display panel will then display a fault code. This code can then be matched to the fault code chart to assist in the diagnosis of the problem.

KN52281,100445A -19-02NOV12-1/1

Auto HST—Reverse Drive Circuit Operation—MY13

Function

The reverse drive circuit causes the electronic drive controller to propel the machine in a controlled reverse direction.

Additionally the electronic drive controller provides for setting the following functions during a reverse drive:

- Maximum travel speed,
- Motion match (pedal responsiveness), and

Each of these additional functions has the ability to be turned on or off by the operator.

Operating Conditions

- Key switch in run position,
- Engine running,
- Operator on seat, and
- Park brake unlocked.
- FNR switch in reverse position
- Drive pedal depressed.

Theory of Operation

The electronic drive controller (drive controller) is a preprogramming electrical device that allows the operator to control the machine reverse drive function and speed via the electrical inputs from the drive foot pedal and the FNR switch. Under normal operating conditions, this creates an output to the reverse proportional solenoid in the transmission.

Current is supplied to the A2 drive controller from the switched power circuit.

With the key switch in the run or accessories position, current is supplied to the 212A Red wire, F11 fuse, 552 series Red wires, X4 connector to the W9 wiring harness to the 552 series Red wires and the A3 terminal of the X26 connector and the drive controller. This power supply is turned off when the key switch is in the start position.

These circuits power the drive controller to allow for drive control operation. The 673A Org wire splices to the 673D, 673C, 673D, 673, and 673F Org wires to provide current

from the drive controller to the throttle position sensor, drive pedal sensor, motion match switch (optional), and the MFWD speed sensor respectively.

When the drive pedal is pressed, the drive pedal sensor rotates and sends voltage back to the drive controller through the 686 Lt Blu wire. The drive controller then processes the voltage from this input command into an output command if the proper operating conditions exist. The output command (current) to the reverse proportional solenoid is proportional to the pedal position.

The proper conditions for a reverse function will be:

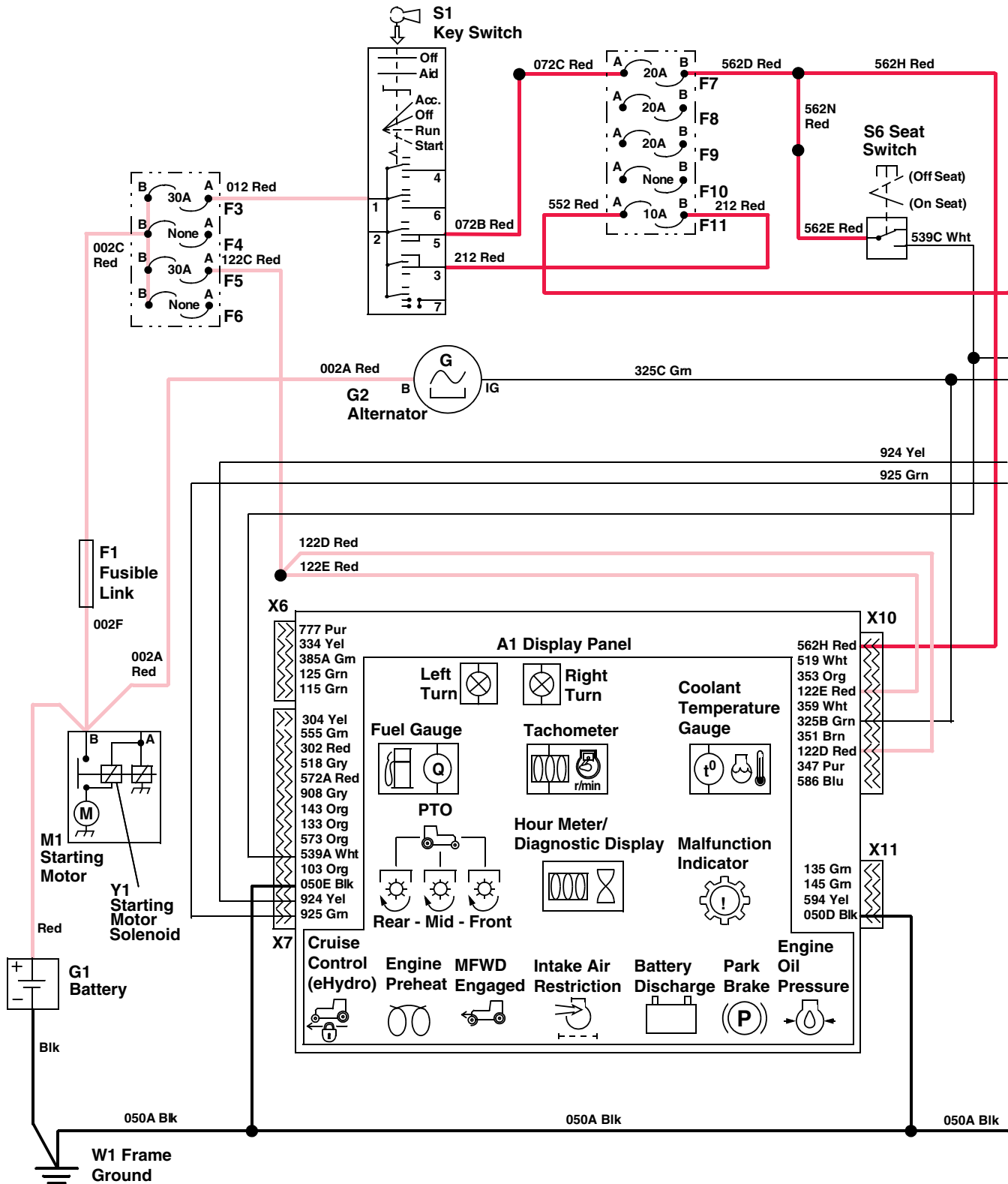
- 12.0 volt input on wire 552N Red wire, power on,
- 12.0 volt input on wire 539D Wht wire, operator on seat,
- 5.0 volt output on wire 673A Org wire, sensor power,
- Continuity to ground on 550A Blk wire, sensor ground,
- Continuity to ground on 050H Blk wire, drive controller ground,
- Voltage input on the 667 Lt Blu wire, drive pedal pressed,
- Frequency input on the 325D Grn wire, engine speed from the alternator,
- Voltage input on the 499A Wht wire, throttle position sensor,
- Frequency input on the 502A Red wire, MFWD speed sensor,
- Voltage input on the 523 Org wire, FNR switch in the reverse position.
- Current output up to 1900mA on 697A Pur wire, reverse proportional solenoid energized, and
- No current output on 696A Blu wire, forward proportional solenoid not energized.

With the proper commands, the drive controller will ramp the output to the reverse proportional solenoid to allow the machine to travel reverse at a speed proportional to the position of the drive pedal, based upon the engine rpm and the range gear selected.

If at any time during the drive function the drive controller detects a problem with any of the input or output commands, the drive controller will provide output current on the 924 series Yel wires to the display panel. The LCD on the display panel will then display a fault code. This code can then be matched to the fault code chart to assist in the diagnosis of the problem.

KN52281,100445B -19-21JAN13-1/1

eHydro™—Reverse Drive Circuit Electrical Schematic—Pre MY08



LVAL11671 —UN—02NOV10

Continued on next page

KN52281,100445C -19-02NOV12-1/3

A1—Display Panel
F1—Fusible Link
F3—Fuse 30A
F4—Not Used
F5—Fuse 30A
F6—Not Used
F7—Fuse 20A
F8—Fuse 20A
F9—Fuse 20A

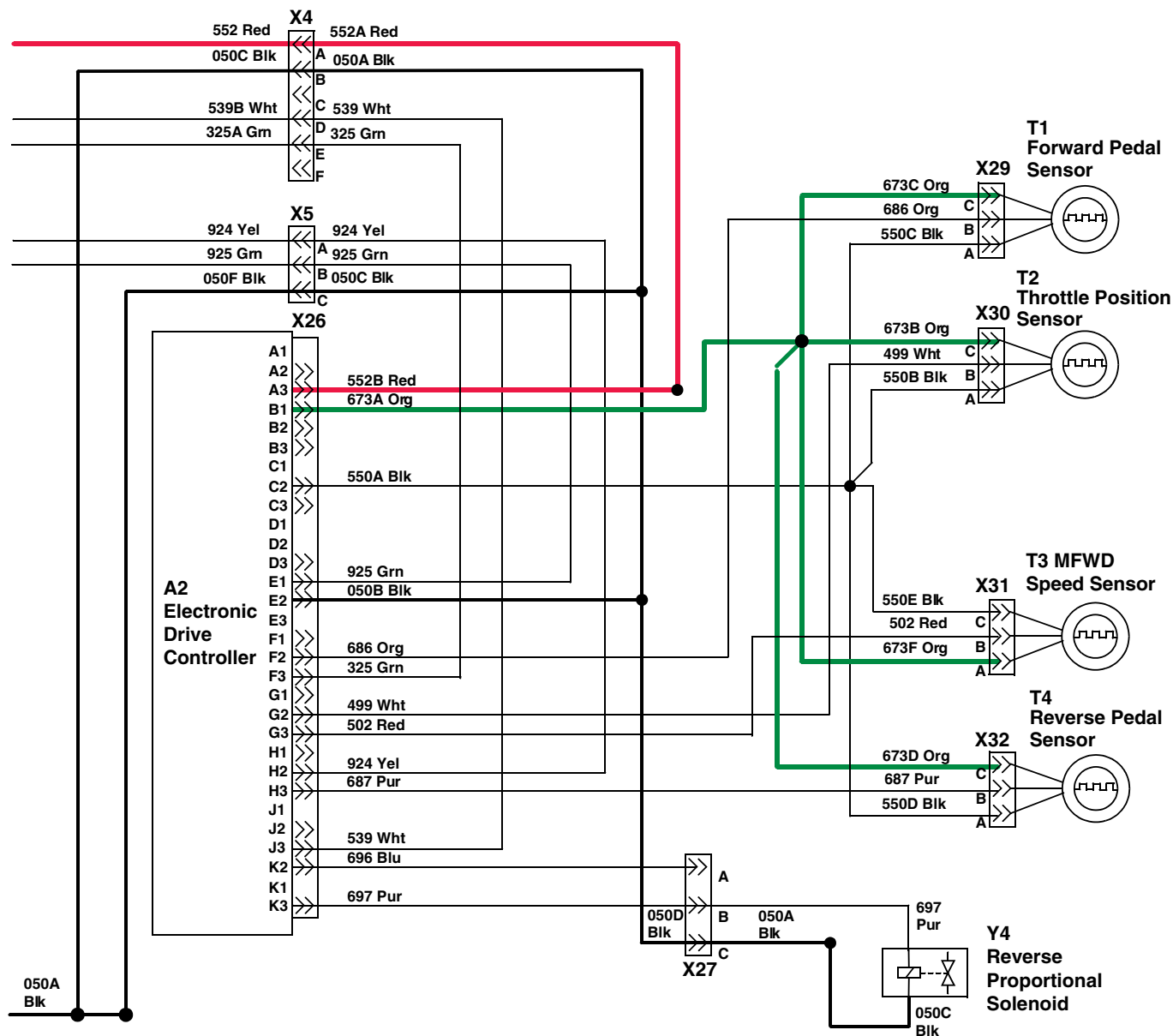
F10—Not Used
F11—Fuse 10A
G1—Battery
G2—Alternator
M1—Starting Motor
S1—Key Switch
S6—Seat Switch
W1—Frame Ground

X6—W1 Main Wiring
Harness-to-A1 Display Panel
X7—W1 Main Wiring
Harness-to-A1 Display Panel
X10—W1 Main Wiring
Harness-to-A1 Display
Panel

X11—W1 Main Wiring
Harness-to-A1 Display
Panel
Y1—Starting Motor Solenoid

Continued on next page

KN52281,100445C -19-02NOV12-2/3



A2—Electronic Drive Controller
T1—Forward Pedal Sensor
T2—Throttle Position Sensor
T3—MFWD Speed Sensor
T4—Reverse Pedal Sensor
X4—W1 Main Wiring
Harness-to-W9 eHydro™
Wiring Harness

X5—W1 Main Wiring
Harness-to-W9 eHydro™
Wiring Harness
X26—W9 eHydro™ Wiring
Harness-to-A2 Electronic
Drive Controller
X27—W9 eHydro™ Wiring
Harness-to-W10
Proportional Valve Wiring
Harness

X29—W9 eHydro™ Wiring
Harness-to-T1 Forward
Pedal Sensor
X30—W9 eHydro™ Wiring
Harness-to-T2 Throttle
Position Sensor
X31—W9 eHydro™ Wiring
Harness-to-T3 MFWD
Speed Sensor X32 - W9

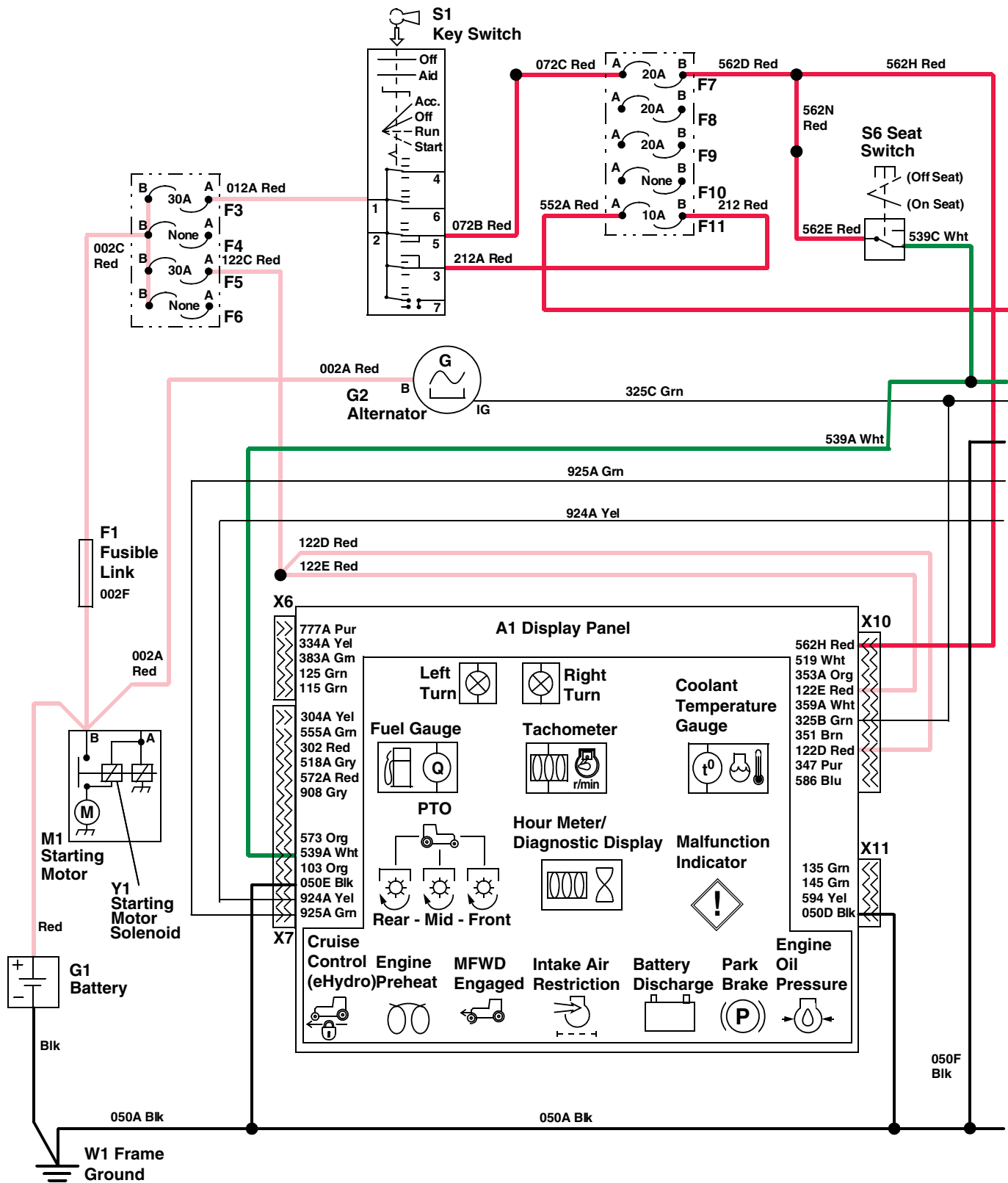
X32—W9 eHydro™ Wiring
Harness-to-T4 Reverse
Pedal Sensor
Y4—Reverse Proportional
Solenoid

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KN52281,100445C -19-02NOV12-3/3

LVAL11672—UN—02NOV10

Auto HST—Reverse Drive Circuit Electrical Schematic—MY08



LVAL11673 —UN—02NOV10

Continued on next page

KN52281,100445D -19-02NOV12-1/5

A1—Display Panel
F1— Fusible Link
F3— Fuse 30A
F4— Not Used
F5— Fuse 30A
F6— Not Used
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A

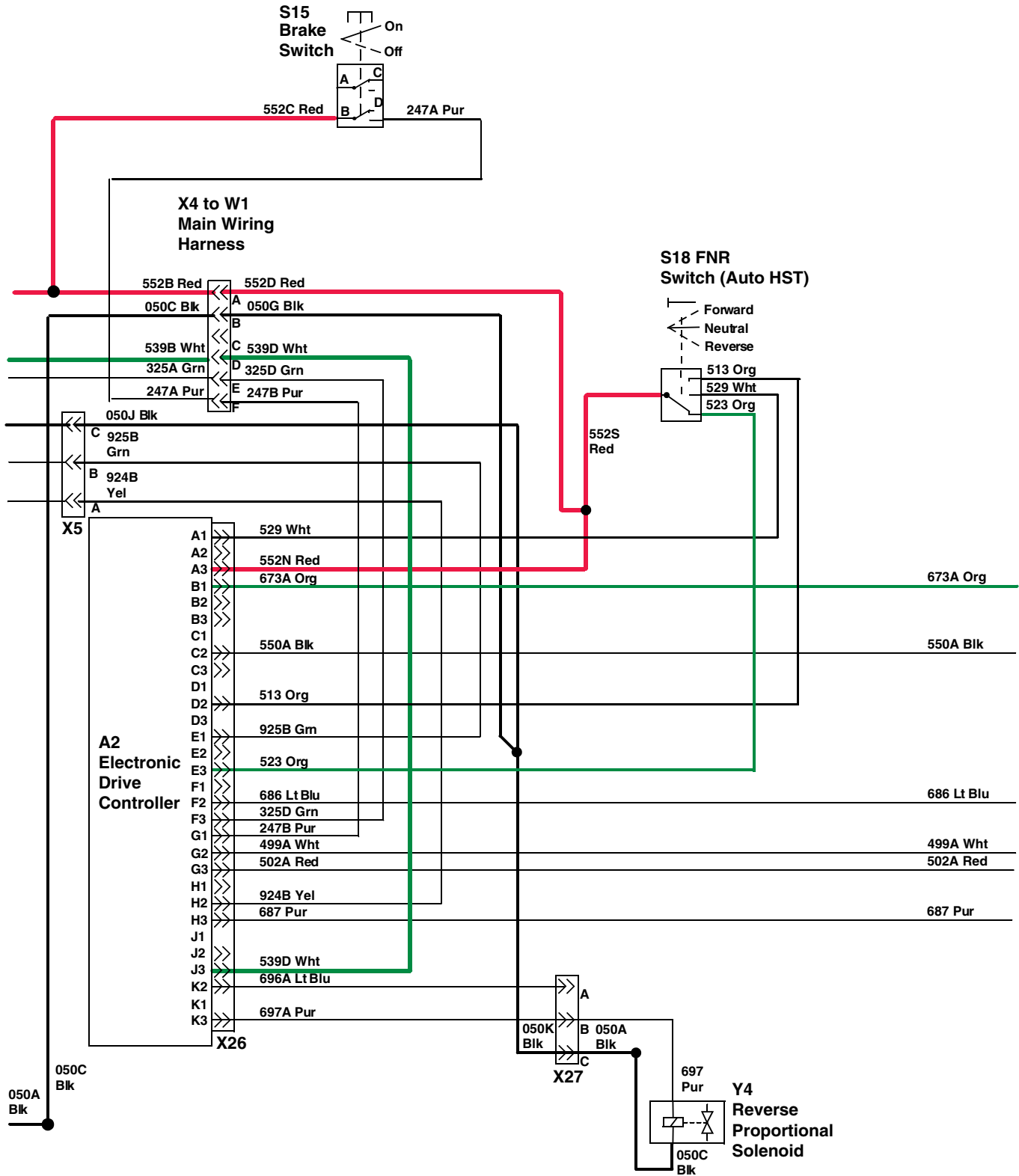
F10— Not Used
F11— Fuse 10A
G1—Battery
G2—Alternator
M1—Starting Motor
S1— Key Switch
S6— Seat Switch
W1—Frame Ground

X6— W1 Main Wiring
Harness-to-A1 Display Panel
X7— W1 Main Wiring
Harness-to-A1 Display Panel
X10— W1 Main Wiring
Harness-to-A1 Display
Panel

X11— W1 Main Wiring
Harness-to-A1 Display
Panel
Y1— Starting Motor Solenoid

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KN52281,100445D -19-02NOV12-2/5



LVAL11674—UN—02NOV10

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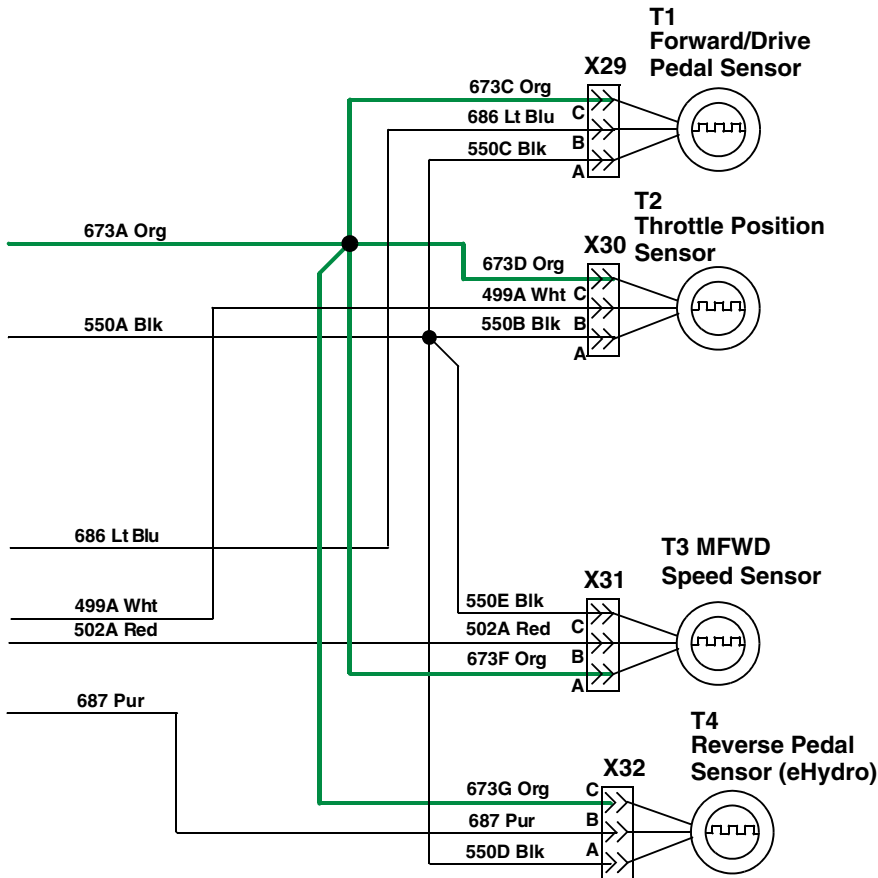
KN52281,100445D -19-02NOV12-3/5

A2—Electronic Drive Controller	X5—W1 Main Wiring Harness-to-W9 eHydro™ Wiring Harness	X27— W9 eHydro™ Wiring Harness-to-W10 Proportional Valve Wiring Harness
S15— Brake Switch		
S18— FNR Switch (Auto HST)		
X4—W1 Main Wiring Harness-to-W9 eHydro™ Wiring Harness	X26— W9 eHydro™ Wiring Harness-to-A2 Electronic Drive Controller	Y4—Reverse Proportional Solenoid

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KN52281,100445D -19-02NOV12-4/5



T1— Forward/Drive Pedal Sensor
 T2— Throttle Position Sensor
 T3— MFWD Speed Sensor
 T4— Reverse Pedal Sensor

X29— W9 eHydro™ Wiring
 Harness-to-T1
 Forward/Drive Pedal
 Sensor

X30— W9 eHydro™ Wiring
 Harness-to-T2 Throttle
 Position Sensor
 X31— W9 eHydro™ Wiring
 Harness-to-T3 MFWD
 Speed Sensor X32 - W9

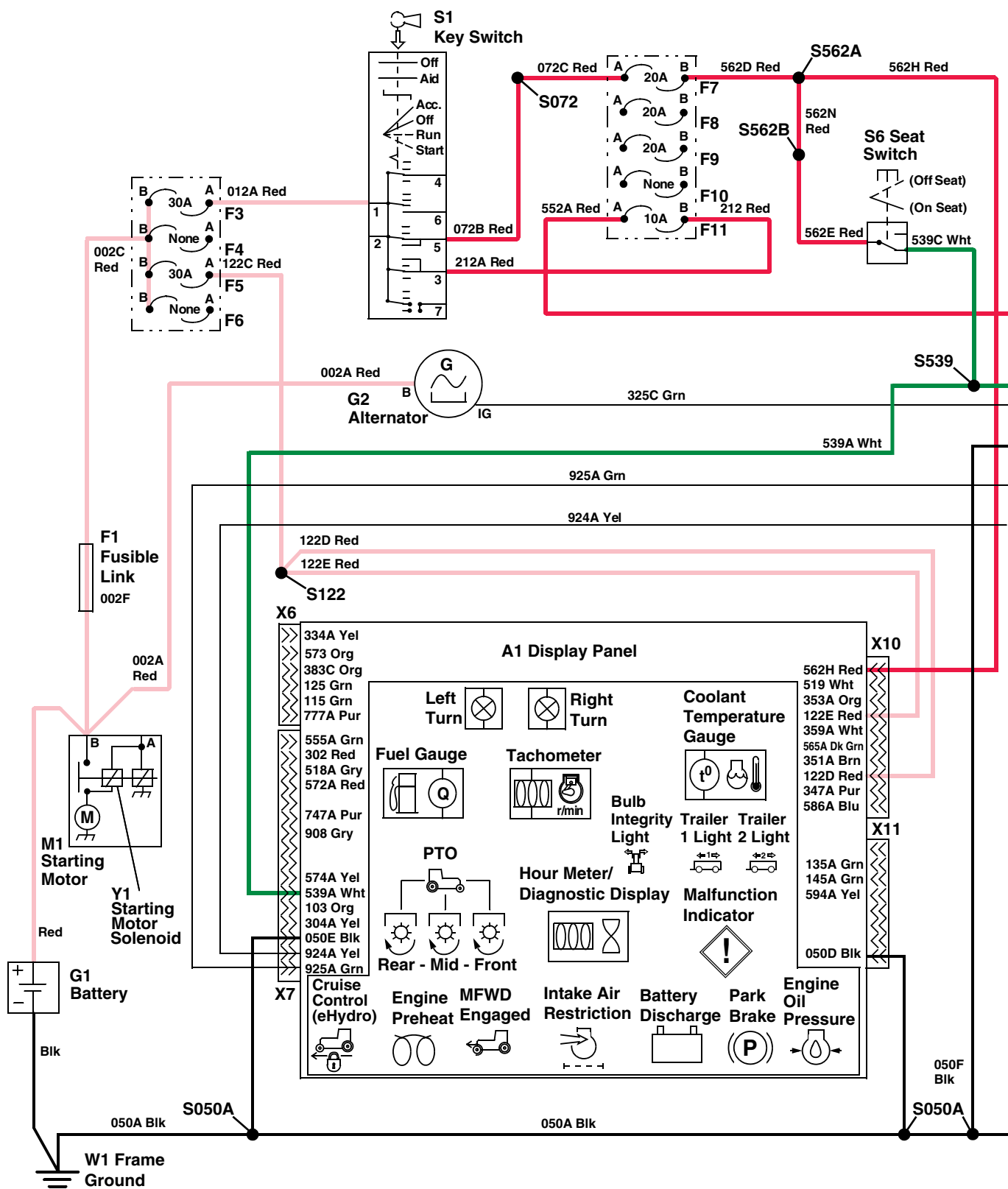
X32— W9 eHydro™ Wiring
 Harness-to-T4 Reverse
 Pedal Sensor

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KN52281,100445D -19-02NOV12-5/5

LVAL11675—UN—02NOV10

Auto HST—Reverse Drive Circuit Electrical Schematic—MY13



LVAL38737—UN—05DEC12

Continued on next page

KN52281,100445E -19-10DEC12-1/5

A1—Display Panel
 F1— Fusible Link
 F3— Fuse 30A
 F4— Not Used
 F5— Fuse 30A
 F6— Not Used
 F7— Fuse 20A
 F8— Fuse 20A
 F9— Fuse 20A

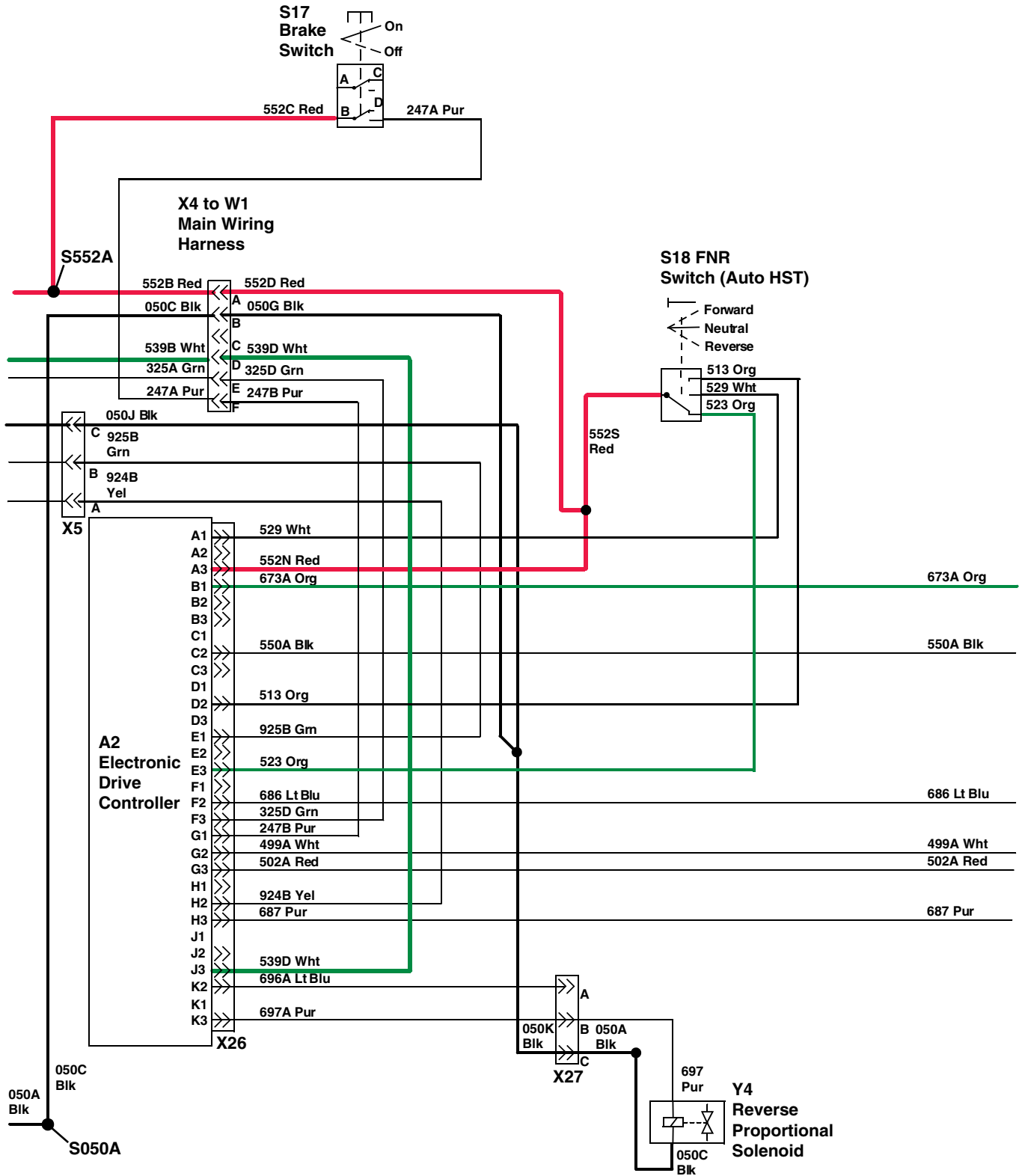
F10— Not Used
 F11— Fuse 10A
 G1—Battery
 G2—Alternator
 M1—Starting Motor
 S1— Key Switch
 S6— Seat Switch
 W1—Frame Ground

X6— W1 Main Wiring
 Harness-to-A1 Display Panel
 X7— W1 Main Wiring
 Harness-to-A1 Display Panel
 X10— W1 Main Wiring
 Harness-to-A1 Display
 Panel

X11— W1 Main Wiring
 Harness-to-A1 Display
 Panel
 Y1— Starting Motor Solenoid

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KN52281,100445E -19-10DEC12-2/5



LVAL38738—UN—09JAN13

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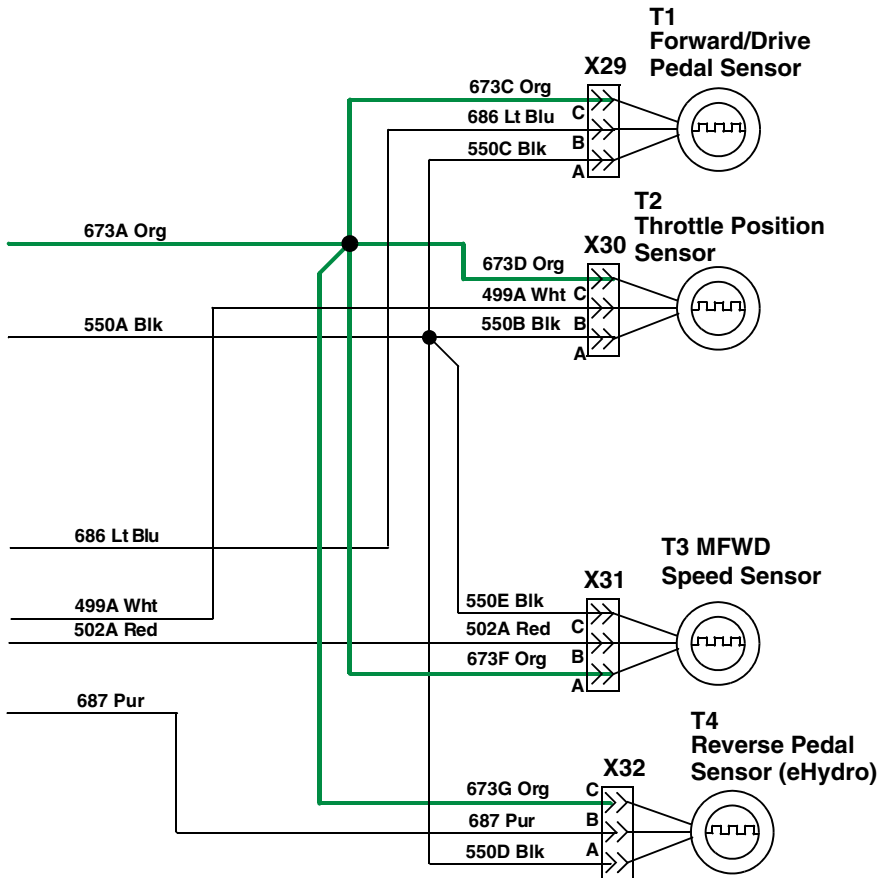
KN52281,100445E -19-10DEC12-3/5

A2—Electronic Drive Controller	X5—W1 Main Wiring Harness-to-W9 eHydro™ Wiring Harness	X27— W9 eHydro™ Wiring Harness-to-W10 Proportional Valve Wiring Harness
S15— Brake Switch		
S18— FNR Switch (Auto HST)		
X4—W1 Main Wiring Harness-to-W9 eHydro™ Wiring Harness	X26— W9 eHydro™ Wiring Harness-to-A2 Electronic Drive Controller	Y4—Reverse Proportional Solenoid

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KN52281,100445E -19-10DEC12-4/5



T1— Forward/Drive Pedal Sensor
 T2— Throttle Position Sensor
 T3— MFWD Speed Sensor
 T4— Reverse Pedal Sensor

X29— W9 eHydro™ Wiring
 Harness-to-T1
 Forward/Drive Pedal
 Sensor

X30— W9 eHydro™ Wiring
 Harness-to-T2 Throttle
 Position Sensor
 X31— W9 eHydro™ Wiring
 Harness-to-T3 MFWD
 Speed Sensor X32 - W9

X32— W9 eHydro™ Wiring
 Harness-to-T4 Reverse
 Pedal Sensor

eHydro is a trademark of Deere & Company

KN52281,100445E -19-10DEC12-5/5

LVAL11675—UN—02NOV10

eHydro™—Reverse Drive Circuit Diagnosis—Pre MY08

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on eHydro™

eHydro is a trademark of Deere & Company

models. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.), and see Diagnostic Mode 2 (eHydro™/Auto HST). The diagnostic mode will provide a reading of current drive component operating values such as voltage, current, or frequency.

KN52281,100445F -19-02NOV12-1/8

Break-out Box.....JDG1575 Test Kit

Test the electrical circuits of the electronic drive controller.

KN52281,100445F -19-02NOV12-2/8

Test Procedure A

Test Conditions:

- Park brake locked.

- Operator on seat.
- Drive pedals released.
- Key switch in run position, engine not running.

KN52281,100445F -19-02NOV12-3/8

Reverse Drive Circuit

KN52281,100445F -19-02NOV12-4/8

Step 1

Do any fault codes appear in the LCD display?

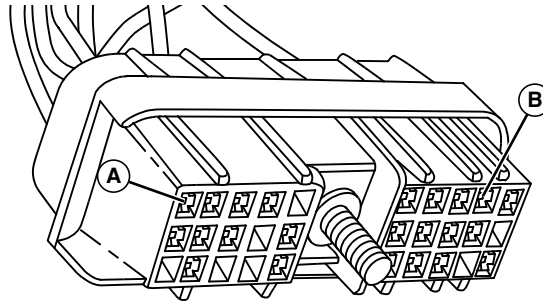
YES: Correct the possible faults. (See [Display Panel Fault Codes—Auto HST/eHydro™](#) in Section 40, Group 45.)

NO: Go to next step.

Continued on next page

KN52281,100445F -19-02NOV12-5/8

Step 2



LVAL11676 —UN—02NOV10

A—X26 Drive Controller Connector Terminal A3, 552B Red Wire

B—X26 Drive Controller Connector Terminal J3, 539 Wht Wire

Disconnect the X26 connector to the drive controller. Is battery voltage present at terminals A3, 552B Red wire (A) and J3 539 Wht wire (B)?

YES: Connect the X26 connector to the drive controller. Go to next step.

NO: 552B or 562 Red wires. Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

NO: 539 Wht wire. Test seat switch. Check 539C, 539B, and 539 Wht wires and connections. Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

KN52281,100445F -19-02NOV12-6/8

Step 3

Test the reverse pedal sensor. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.), and/or (See [eHydro™—Forward and Reverse Pedal Sensor Test and Adjustment](#) in Section 40, Group 50.) Does the pedal sensor measure within specification?

YES: Go to next step.

NO: Adjust, repair, or replace components as directed in the pedal sensor test.

KN52281,100445F -19-02NOV12-7/8

Step 4

Test the reverse proportional solenoid coil. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.) Does the solenoid coil measure within specification?

YES: Electrical test complete. Test the hydrostatic power train. (See [Troubleshooting](#) in Section 70, Group 30.) of the Power Train—Hydrostatic Section.

NO: Adjust, repair, or replace components as directed in the proportional solenoid coil test.

KN52281,100445F -19-02NOV12-8/8

eHydro™—Reverse Drive Circuit Diagnosis—MY08

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on eHydro™

eHydro is a trademark of Deere & Company

models. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.), and see Diagnostic Mode 2 (eHydro™/Auto HST). The diagnostic mode will provide a reading of current drive component operating values such as voltage, current, or frequency.

KN52281,1004460 -19-02NOV12-1/8

Break-out Box.....JDG1575 Test Kit

Test the electrical circuits of the electronic drive controller.

KN52281,1004460 -19-02NOV12-2/8

Test Procedure A

Test Conditions:

- Park brake locked.

- Operator on seat.
- Drive pedals released.
- Key switch in run position, engine not running.

KN52281,1004460 -19-02NOV12-3/8

Reverse Drive Circuit

KN52281,1004460 -19-02NOV12-4/8

Step 1

Do any fault codes appear in the LCD display?

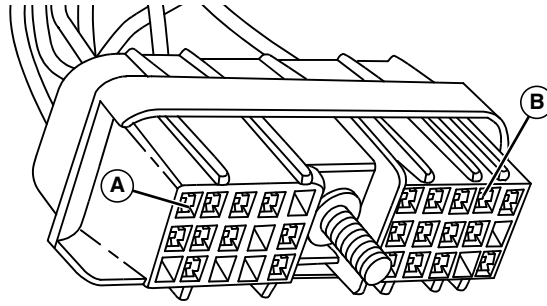
YES: Correct the possible faults. (See [Display Panel Fault Codes—Auto HST/eHydro™](#) in Section 40, Group 50.)

NO: Go to next step.

Continued on next page

KN52281,1004460 -19-02NOV12-5/8

Step 2



LVAL11677 —UN—02NOV10

A—X26 Drive Controller Connector Terminal A3, 552N Red Wire

B—X26 Drive Controller Connector Terminal J3, 539A Wht Wire

Disconnect the X26 connector to the drive controller. Is battery voltage present at terminals A3, 552N Red wire (A) and J3 539A Wht wire (B)?

YES: Connect the X26 connector to the drive controller. Go to next step.

NO: 552N or 562D Red wires. Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

NO: 539A Wht wire. Test seat switch. Check 539D, 539B, and 539C. and 539A Wht wires and connections. Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

NO: Test the S6 seat switch. (See [Seat Switch Test](#) in Section 40, Group 40.)

KN52281,1004460 -19-02NOV12-6/8

Step 3

Test the reverse pedal sensor. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.), and/or (See [eHydro™—Forward and Reverse Pedal Sensor Test and Adjustment](#) in Section 40, Group 50.) Does the pedal sensor measure within specification?

YES: Go to next step.

NO: Adjust, repair, or replace components as directed in the pedal sensor test.

KN52281,1004460 -19-02NOV12-7/8

Step 4

Test the reverse proportional solenoid coil. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.) Does the solenoid coil measure within specification?

YES: Electrical test complete. Test the hydrostatic power train. (See [Troubleshooting](#) in Section 70, Group 30.) of the Power Train—Hydrostatic Section.

NO: Adjust, repair, or replace components as directed in the proportional solenoid coil test.

KN52281,1004460 -19-02NOV12-8/8

eHydro™—Reverse Drive Circuit Diagnosis—MY13

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on eHydro™

eHydro is a trademark of Deere & Company

models. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 50.), and see Diagnostic Mode 2 (eHydro™/Auto HST). The diagnostic mode will provide a reading of current drive component operating values such as voltage, current, or frequency.

KN52281,1004461 -19-21JAN13-1/8

Break-out Box.....JDG1575 Test Kit

Test the electrical circuits of the electronic drive controller.

KN52281,1004461 -19-21JAN13-2/8

Test Procedure A

Test Conditions

- Park brake locked.

- Operator on seat.
- Drive pedals released.
- Key switch in run position, engine not running.

KN52281,1004461 -19-21JAN13-3/8

Reverse Drive Circuit

KN52281,1004461 -19-21JAN13-4/8

Step 1

Do any fault codes appear in the LCD display?

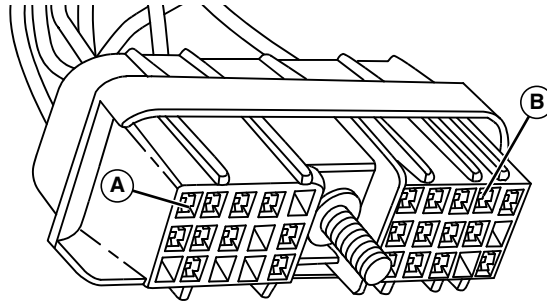
YES: (See [Display Panel Fault Codes—Auto HST/eHydro™](#) in Section 40, Group 50.)

NO: Go to next step.

Continued on next page

KN52281,1004461 -19-21JAN13-5/8

Step 2



LVAL11677 —UN—02NOV10

A—X26 Drive Controller Connector Terminal A3, 552N Red Wire

B—X26 Drive Controller Connector Terminal J3, 539D Wht Wire

Disconnect the X26 connector to the drive controller. Is battery voltage present at terminals A3, 552N Red wire (A) and J3 539D Wht wire (B)?

YES: Connect the X26 connector to the drive controller. Go to next step.

NO: 552N or 562D Red wires. Test the switched power circuit. (See [Power Circuit Diagnosis—MY13—NA](#) in Section 40, Group 40.)

NO: 539A Wht wire. Test seat switch. Check 539D, 539B, and 539C. and 539A Wht wires and connections. Test the switched power circuit. (See [Power Circuit Diagnosis—MY13—NA](#) in Section 40, Group 40.)

NO: Test the S6 seat switch. (See [Seat Switch Test](#) in Section 40, Group 45.)

KN52281,1004461 -19-21JAN13-6/8

Step 3

Test the reverse pedal sensor. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 50.), and/or (See [eHydro™—Forward and Reverse Pedal Sensor Test and Adjustment](#) in Section 40, Group 55.)

Does the pedal sensor measure within specification?

YES: Go to next step.

NO: Adjust, repair, or replace components as directed in the pedal sensor test.

KN52281,1004461 -19-21JAN13-7/8

Step 4

Test the reverse proportional solenoid coil. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 50.) Does the solenoid coil measure within specification?

YES: Electrical test complete. Test the hydrostatic power train. [See [Troubleshooting](#) in Section 70, Group 30 (Power Train—Hydrostatic)]

NO: Adjust, repair, or replace components as directed in the proportional solenoid coil test.

KN52281,1004461 -19-21JAN13-8/8

Auto HST—Reverse Drive Circuit Diagnosis

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on Auto HST models. (See [Entering Diagnostic and Calibration Modes](#)

in Section 40, Group 45.), and see Diagnostic Mode 2 (eHydro™/Auto HST). The diagnostic mode will provide a reading of current drive component operating values such as voltage, current, or frequency.

KN52281,1004462 -19-02NOV12-1/9

Break-out Box.....JDG1575 Test Kit

Test the electrical circuits of the electronic drive controller.

KN52281,1004462 -19-02NOV12-2/9

Test Procedure A

Test Conditions:

- Park brake locked.

- Operator on seat.
- Drive pedal released.
- FNR switch in reverse position.
- Key switch in run position, engine not running.

KN52281,1004462 -19-02NOV12-3/9

Reverse Drive Circuit

KN52281,1004462 -19-02NOV12-4/9

Step 1

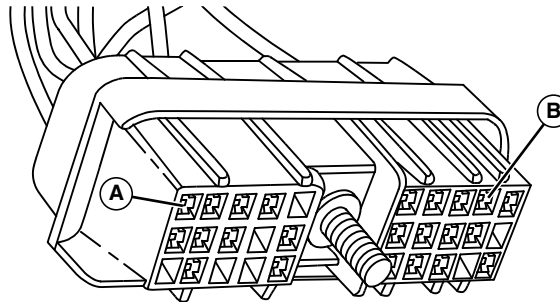
Do any fault codes appear in the LCD display?

YES: Correct the possible faults. (See [Display Panel Fault Codes—Auto HST/eHydro™](#) in Section 40, Group 45.)

NO: Go to next step.

KN52281,1004462 -19-02NOV12-5/9

Step 2



LVAL11678 —UN—02NOV10

A—X26 Drive Controller Connector Terminal A3, 552N Red Wire

B—X26 Drive Controller Connector Terminal J3, 539D Wht Wire

Disconnect the X26 connector to the drive controller. Is battery voltage present at terminals A3, 552N Red wire (A) and J3 539D Wht wire (B)?

YES: Connect the X26 connector to the drive controller. Go to next step.

NO: 552N or 552D Red wires. Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

NO: 539 Wht wire. Test seat switch. Check 539C, 539B, and 539 Wht wires and connections. Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

Continued on next page

KN52281,1004462 -19-02NOV12-6/9

<p>Step 3</p>	<p>Is battery voltage present at A2 drive controller, 523 Org wire?</p>	<p>YES: Go to next step.</p> <p>NO: Test related switched power circuits.</p> <p>NO: Test S18 FNR switch. (See FNR Switch Test—Auto HST in Section 40, Group 40.)</p> <p>NO: Check 523 Org wire and connections.</p> <p>KN52281,1004462 -19-02NOV12-7/9</p>
<p>Step 4</p>	<p>Test the drive pedal sensor. (See Entering Diagnostic and Calibration Modes in Section 40, Group 45.), and/or (see Auto HST—Drive Pedal Sensor Test and Adjustment in Section 40, Group 50.) Does the pedal sensor measure within specification?</p> <p style="text-align: center;">Drive Pedal—Specification</p> <p>Input—Voltage.....5.0 ± 0.2 V</p> <p>Released Position Signal—Voltage.....0.6—0.9 V</p> <p>Pressed Position Signal—Voltage.....2.7—3.5 V</p> <p style="text-align: right;">greater than released signal voltage</p> <p>Lock Nut—Torque.....5 N•m (44 lb-in.)</p>	<p>YES: Go to next step.</p> <p>NO: Adjust, repair, or replace components as directed in the pedal sensor test.</p> <p>KN52281,1004462 -19-02NOV12-8/9</p>
<p>Step 5</p>	<p>Test the forward proportional solenoid coil. (See Entering Diagnostic and Calibration Modes in Section 40, Group 45.) or (see Proportional Drive Solenoid Test—eHydro™/Auto HST in Section 40, Group 40.) Does the solenoid coil measure within specification?</p>	<p>YES: Electrical test complete. Test the hydrostatic power train. (See Troubleshooting in Section 70, Group 30.) of the Power Train—Hydrostatic section.</p> <p>NO: Adjust, repair, or replace components as directed in the proportional solenoid coil test.</p> <p>KN52281,1004462 -19-02NOV12-9/9</p>

eHydro™—Cruise Control Circuit Operation (Standard)—Pre MY08

Function:

To control the machine's forward drive speed at a constant speed that can be repeated without having to hold the forward drive pedal at that speed.

Operating Conditions:

- Key switch in run position
- Engine running
- Operator on seat
- Park brake unlocked
- Right brake pedal not depressed
- Forward pedal pressed to desired speed while setting the drive speed
- Cruise switch on and pressed to the set position momentarily when the desired drive speed is attained

The cruise control will remain engaged until the brake is depressed; the key switch is turned to the off position; the reverse pedal is depressed; or, the cruise control switch is placed into the off position.

Theory of Operation:

The cruise control uses the electronic drive controller (drive controller) to allow the operator to set and hold a forward drive speed setting that the operator desires without having to press and hold the forward pedal.

The cruise control circuit uses the forward pedal sensor, alternator, throttle position sensor, and the MFWD speed sensor to provide input to the drive controller. The drive controller then processes these inputs to provide output current to the forward proportional solenoid.

Placing the cruise control switch to the on position, enables the cruise control function. Momentarily pressing the cruise switch to the set position will then set the cruise speed at the speed being traveled. Once set, the drive controller monitors the machine speed and varies the current to the forward proportional solenoid to maintain travel speed at the set point.

To adjust travel speed, disengage cruise control and engage cruise control again at a different speed.

Placing the cruise control switch in the off position or pressing either the right brake pedal or reverse pedal will disengage the cruise function.

eHydro is a trademark of Deere & Company

Switched power is provided to the cruise control switch from the key switch, 212 Red, F11 fuse, 552 Red wire in the W1 main wiring harness, X4 connector, 552A and 552D Red wires in the W9 eHydro™ wiring harness, X28 connector, and the 552A, 552B, and 552C Red wires in the W11 cruise control wiring harness.

When the cruise control switch is in the on position current is provided to the 238 Gry wire of the W11 and W9 wiring harnesses to the A2 drive controller. This input enables the cruise control function.

The next input signal needed to activate the cruise circuit is an input from the forward pedal sensor on wire 686 Lt Blu. This circuit causes an output on the 696 Blu wire to the forward proportional solenoid which in turn causes the machine to move forward.

Once the drive controller receives an input from the forward pedal sensor, the cruise control switch may be pressed to the lock position momentarily to set the drive speed.

Momentarily pressing the cruise control switch to the lock position supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller. This input will set the cruise speed at the speed being traveled.

At the moment the lock signal is received by the drive controller, the drive controller records the inputs from the forward pedal sensor (686 Lt Blu), alternator (325 Grn), throttle position sensor (499 Wht), and the MFWD speed sensor (502 Red). The drive controller then supplies an output current to the forward proportional solenoid (696 Blu) to maintain the speed recorded at the MFWD speed sensor.

If changes in machine loading or range gear position settings do not allow the drive controller to maintain the speed setting, the drive controller will attempt to maintain the speed setting by sending either the maximum (fastest speed possible) or minimum (slowest speed possible) current to the forward proportional solenoid. If the machine is driving either up or down a grade, the drive controller will increase or decrease the output current to the forward proportional solenoid to maintain the speed at the MFWD speed sensor. If the operator changes the throttle position, the drive controller will again vary the output to the forward proportional solenoid to maintain the drive speed at the MFWD speed sensor.

KN52281,1004463 -19-02NOV12-1/1

Auto HST—Cruise Control Circuit Operation (Standard)—MY08

Function:

To control the machine's forward drive speed at a constant speed that can be repeated without having to hold the forward drive pedal at that speed.

Operating Conditions:

- Key switch in run position
- Engine running
- Operator on seat
- Park brake unlocked
- Brake pedal not depressed
- FNR switch in the forward position
- Drive pedal pressed to desired speed while setting the drive speed
- Cruise switch on and pressed to the set position momentarily when the desired drive speed is attained

The cruise control will remain engaged until the brake is depressed; the key switch is turned to the off position; the FNR switch is placed in the neutral or reverse positions; or, the cruise control switch is placed into the off position.

Theory of Operation:

The cruise control uses the electronic drive controller (drive controller) to allow the operator to set and hold a forward drive speed setting that the operator desires without having to press and hold the drive pedal.

The cruise control circuit uses the drive pedal sensor, alternator, throttle position sensor, and the MFWD speed sensor to provide input to the drive controller. The drive controller then processes these inputs to provide output current to the forward proportional solenoid.

Placing the cruise control switch to the on position, enables the cruise control function. Momentarily pressing the cruise switch to the set position will then set the cruise speed at the speed being traveled. Once set, the drive controller monitors the machine speed and varies the current to the forward proportional solenoid to maintain travel speed at the set point.

To adjust travel speed, disengage cruise control and engage cruise control again at a different speed.

Placing the cruise control switch in the off position, pressing the brake pedal, or placing the FNR switch in either the neutral or reverse positions will disengage the cruise function.

eHydro is a trademark of Deere & Company

Switched power is provided to the cruise control switch from the key switch, 212A Red, F11 fuse, 552 series Red wires in the W1 main wiring harness, X4 connector, 552 series Red wires in the W9 eHydro™ wiring harness, X28 connector, and the 552A, 552B, and 552C Red wires in the W11 cruise control wiring harness.

When the cruise control switch is in the on position current is provided to the 238 series Gry wires of the W11 and W9 wiring harnesses to the A2 drive controller. This input enables the cruise control function.

The next input signal needed to activate the cruise circuit is an input from the drive pedal sensor on wire 686 Lt Blu. This circuit causes an output on the 696A Lt Blu wire to the forward proportional solenoid which in turn causes the machine to move forward.

Once the drive controller receives an input from the drive pedal sensor, the cruise control switch may be pressed to the lock position momentarily to set the drive speed.

Momentarily pressing the cruise control switch to the lock position supplies power from the 552B Red wire across the switch to the 265 series Grn wires to the drive controller. This input will set the cruise speed at the speed being traveled.

At the moment the lock signal is received by the drive controller, the drive controller records the inputs from the drive pedal sensor (686 Lt Blu), alternator (325D Grn), throttle position sensor (499A Wht), and the MFWD speed sensor (502A Red). The drive controller then supplies an output current to the forward proportional solenoid (696A Lt Blu) to maintain the speed recorded at the MFWD speed sensor.

If changes in machine loading or range gear position settings do not allow the drive controller to maintain the speed setting, the drive controller will attempt to maintain the speed setting by sending either the maximum (fastest speed possible) or minimum (slowest speed possible) current to the forward proportional solenoid. If the machine is driving either up or down a grade, the drive controller will increase or decrease the output current to the forward proportional solenoid to maintain the speed at the MFWD speed sensor. If the operator changes the throttle position, the drive controller will again vary the output to the forward proportional solenoid to maintain the drive speed at the MFWD speed sensor.

KN52281,1004464 -19-02NOV12-1/1

Auto HST—Cruise Control Circuit Operation (Standard)—MY13

Function

To control the machine's forward drive speed at a constant speed that can be repeated without having to hold the forward drive pedal at that speed.

Operating Conditions

- Key switch in run position
- Engine running
- Operator on seat
- Park brake unlocked
- Brake pedal not depressed
- FNR switch in the forward position
- Drive pedal pressed to desired speed while setting the drive speed
- Cruise switch on and pressed to the set position momentarily when the desired drive speed is attained

The cruise control will remain engaged until the brake is depressed; the key switch is turned to the off position; the FNR switch is placed in the neutral or reverse positions; or, the cruise control switch is placed into the off position.

Theory of Operation

The cruise control uses the electronic drive controller (drive controller) to allow the operator to set and hold a forward drive speed setting that the operator desires without having to press and hold the drive pedal.

The cruise control circuit uses the drive pedal sensor, alternator, throttle position sensor, and the MFWD speed sensor to provide input to the drive controller. The drive controller then processes these inputs to provide output current to the forward proportional solenoid.

Placing the cruise control switch to the on position, enables the cruise control function. Momentarily pressing the cruise switch to the set position will then set the cruise speed at the speed being traveled. Once set, the drive controller monitors the machine speed and varies the current to the forward proportional solenoid to maintain travel speed at the set point.

To adjust travel speed, disengage cruise control and engage cruise control again at a different speed.

Placing the cruise control switch in the off position, pressing the brake pedal, or placing the FNR switch in either the neutral or reverse positions will disengage the cruise function.

eHydro is a trademark of Deere & Company

Switched power is provided to the cruise control switch from the key switch, 212A Red, F11 fuse, 552 series Red wires in the W1 main wiring harness, X4 connector, 552 series Red wires in the W9 eHydro™ wiring harness, X28 connector, and the 552A, 552B, and 552C Red wires in the W11 cruise control wiring harness.

When the cruise control switch is in the on position current is provided to the 238 series Gry wires of the W11 and W9 wiring harnesses to the A2 drive controller. This input enables the cruise control function.

The next input signal needed to activate the cruise circuit is an input from the drive pedal sensor on wire 686 Lt Blu. This circuit causes an output on the 696A Lt Blu wire to the forward proportional solenoid which in turn causes the machine to move forward.

Once the drive controller receives an input from the drive pedal sensor, the cruise control switch may be pressed to the lock position momentarily to set the drive speed.

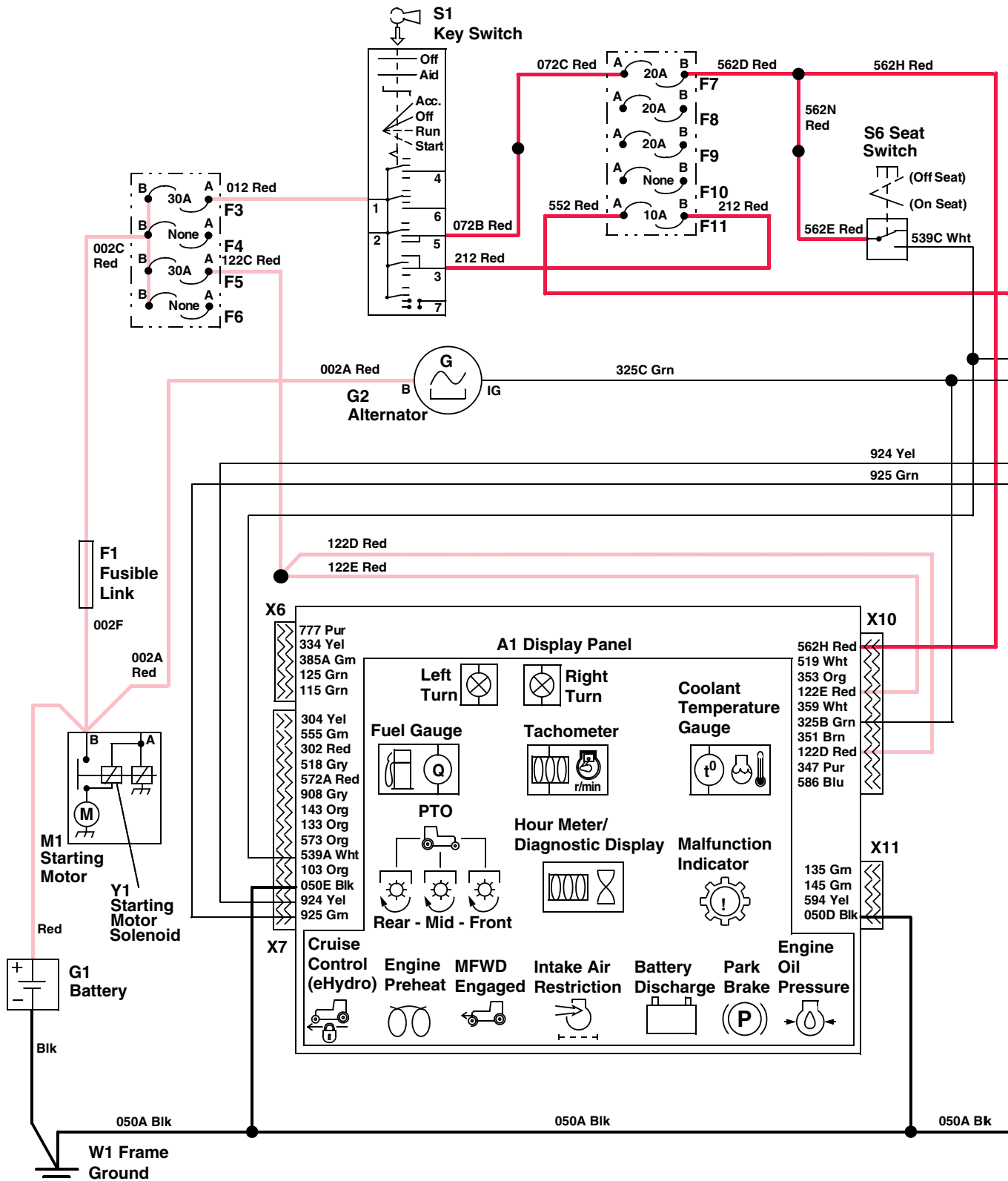
Momentarily pressing the cruise control switch to the lock position supplies power from the 552B Red wire across the switch to the 265 series Grn wires to the drive controller. This input will set the cruise speed at the speed being traveled.

At the moment the lock signal is received by the drive controller, the drive controller records the inputs from the drive pedal sensor (686 Lt Blu), alternator (325D Grn), throttle position sensor (499A Wht), and the MFWD speed sensor (502A Red). The drive controller then supplies an output current to the forward proportional solenoid (696A Lt Blu) to maintain the speed recorded at the MFWD speed sensor.

If changes in machine loading or range gear position settings do not allow the drive controller to maintain the speed setting, the drive controller will attempt to maintain the speed setting by sending either the maximum (fastest speed possible) or minimum (slowest speed possible) current to the forward proportional solenoid. If the machine is driving either up or down a grade, the drive controller will increase or decrease the output current to the forward proportional solenoid to maintain the speed at the MFWD speed sensor. If the operator changes the throttle position, the drive controller will again vary the output to the forward proportional solenoid to maintain the drive speed at the MFWD speed sensor.

KN52281,1004465 -19-21JAN13-1/1

eHydro™—Cruise Control Circuit Electrical Schematic (Standard)—Pre MY08



LVAL11679 —UN—02NOV10

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KN52281,1004466 -19-02NOV12-1/4

A1—Display Panel
 F1— Fusible Link
 F3— Fuse 30A
 F4— Not Used
 F5— Fuse 30A
 F6— Not Used
 F7— Fuse 20A
 F8— Fuse 20A
 F9— Fuse 20A

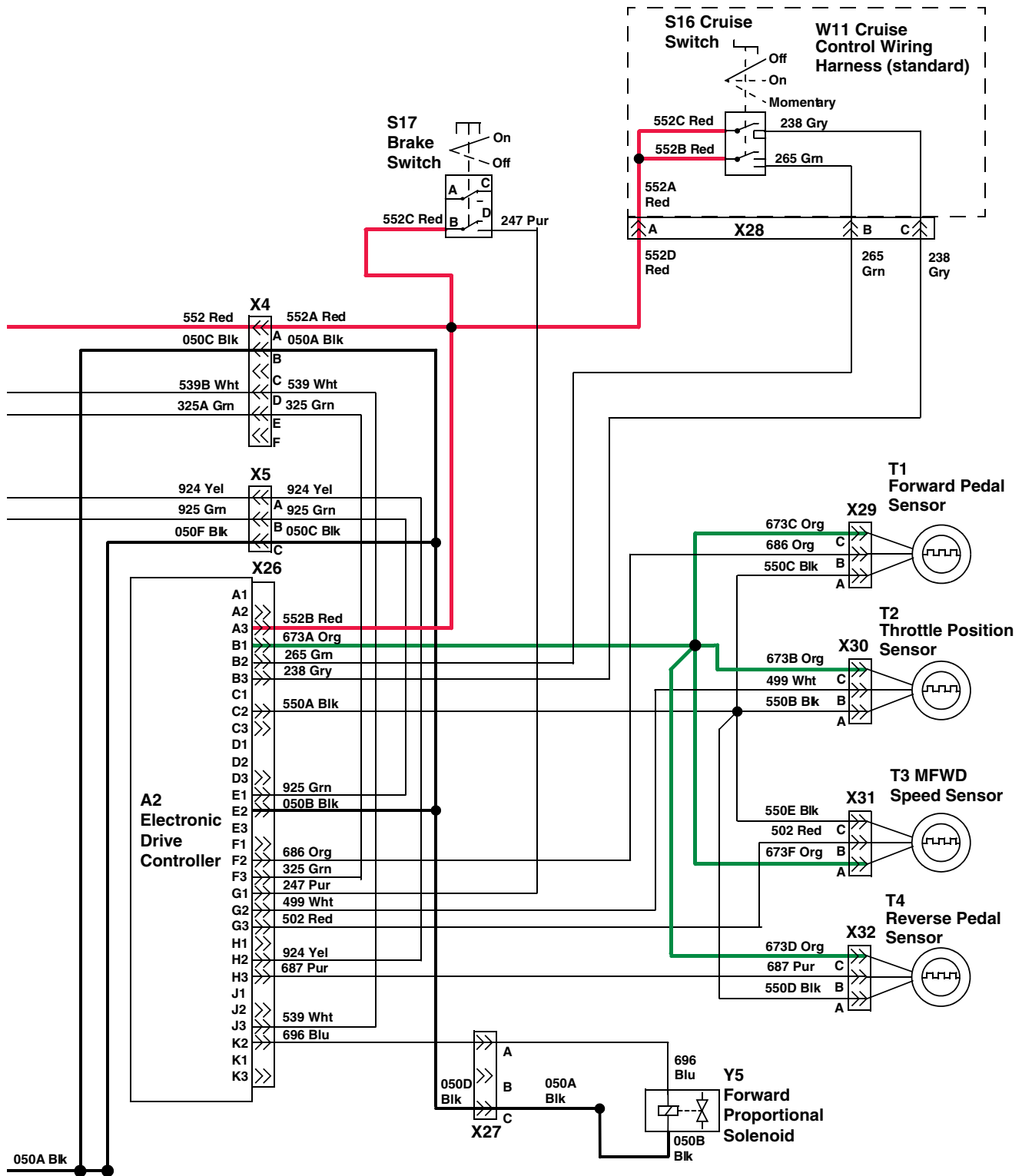
F10— Not Used
 F11— Fuse 10A
 G1—Battery
 G2—Alternator
 M1—Starting Motor
 S1— Key Switch
 S6— Seat Switch
 W1—Frame Ground

X6— W1 Main Wiring
 Harness-to-A1 Display Panel
 X7— W1 Main Wiring
 Harness-to-A1 Display Panel
 X10— W1 Main Wiring
 Harness-to-A1 Display
 Panel

X11— W1 Main Wiring
 Harness-to-A1 Display
 Panel
 Y1— Starting Motor Solenoid

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KN52281,1004466 -19-02NOV12-2/4



LVAL11680—UN—02NOV10

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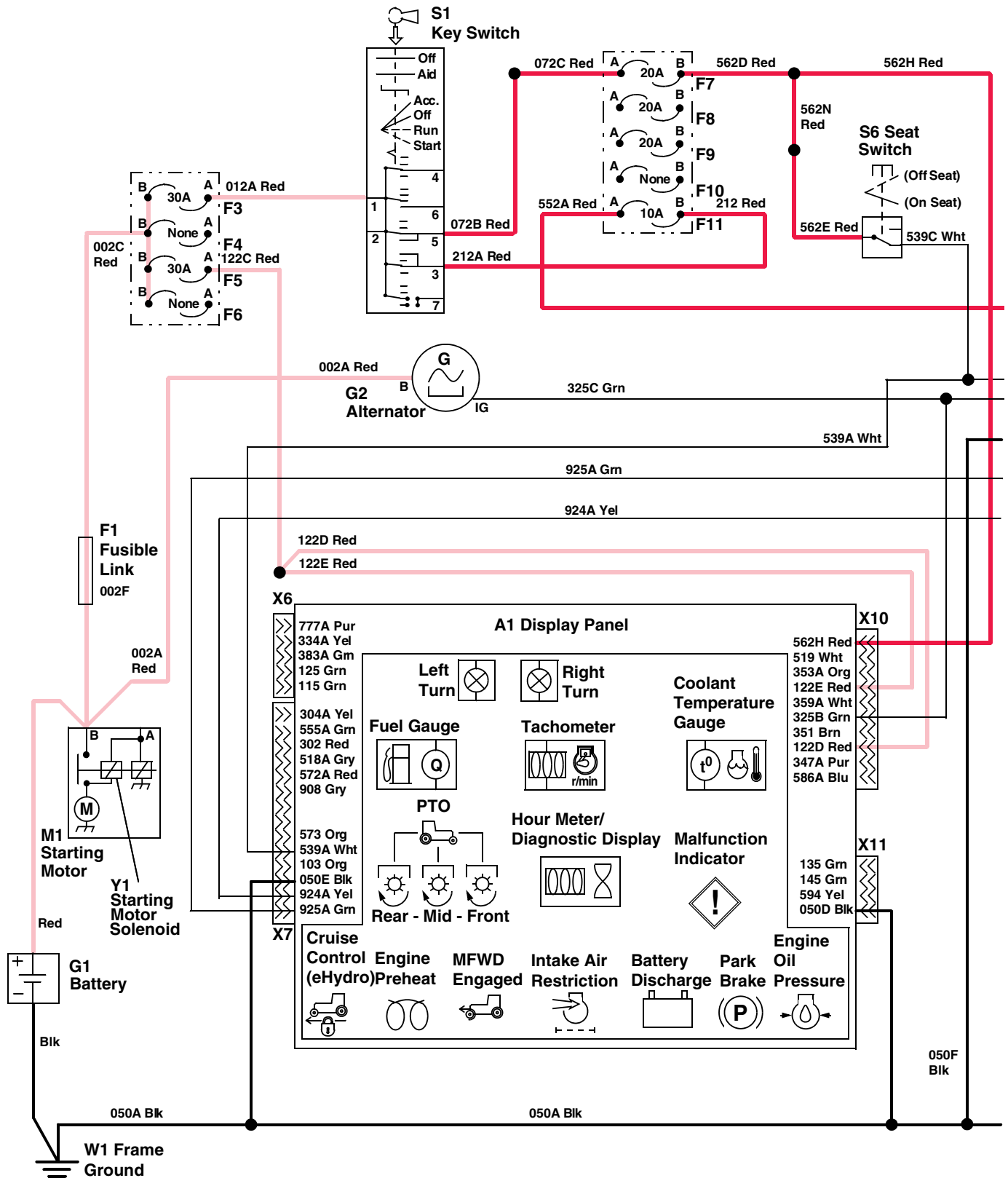
KN52281,1004466 -19-02NOV12-3/4

A2—Electronic Drive Controller	X4—W1 Main Wiring Harness-to-W9 eHydro™ Wiring Harness	X28— W9 eHydro™ Wiring Harness to W12 Cruise Control Wiring Harness (standard)	X32— W9 eHydro™ Wiring Harness-to-T4 Reverse Pedal Sensor
S16— Cruise Control Switch (standard)	X5—W1 Main Wiring Harness-to-W9 eHydro™ Wiring Harness	X29— W9 eHydro™ Wiring Harness-to-T1 Forward Pedal Sensor	Y5— Forward Proportional Solenoid
S17— Brake Switch	X26— W9 eHydro™ Wiring Harness-to-A2 Electronic Drive Controller	X30— W9 eHydro™ Wiring Harness-to-T2 Throttle Position Sensor	
T1— Forward Pedal Sensor	X27— W9 eHydro™ Wiring Harness-to-W10 Proportional Valve Wiring Harness	X31— W9 eHydro™ Wiring Harness-to-T3 MFWD Speed Sensor	
T2— Throttle Position Sensor			
T3— MFWD Speed Sensor			
T4— Reverse Pedal Sensor			
W11— Cruise Control Wiring Harness (standard)			

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KN52281,1004466 -19-02NOV12-4/4

eHydro™/Auto HST—Cruise Control Circuit Electrical Schematic (Standard)—MY08



LVAL11681 —UN—02NOV10

Continued on next page

KN52281,1004467 -19-16JAN13-1/6

A1—Display Panel
F1— Fusible Link
F3— Fuse 30A
F4— Not Used
F5— Fuse 30A
F6— Not Used
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A

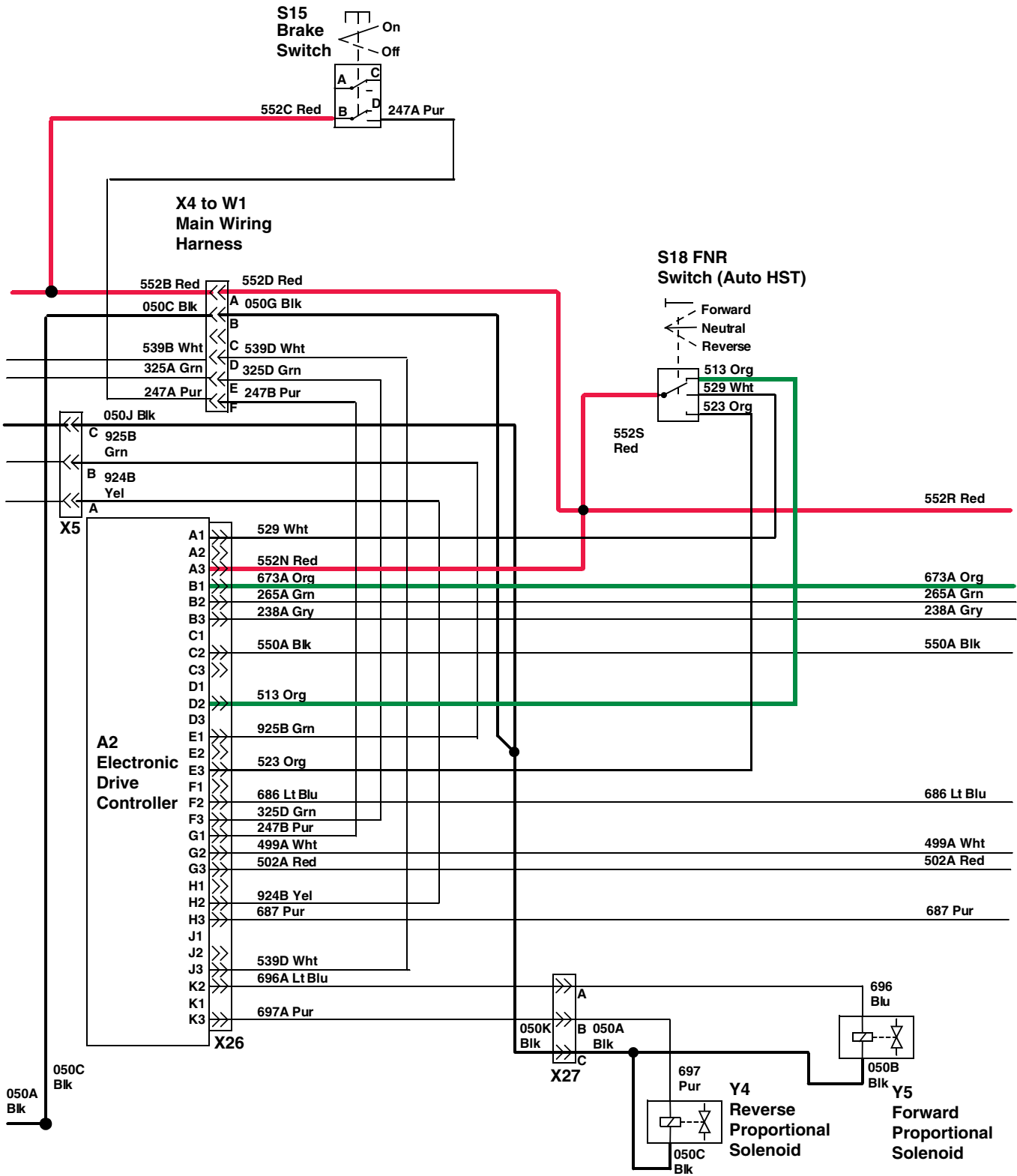
F10— Not Used
F11— Fuse 10A
G1—Battery
G2—Alternator
M1—Starting Motor
S1— Key Switch
S6— Seat Switch
W1—Frame Ground

X6— W1 Main Wiring
Harness-to-A1 Display Panel
X7— W1 Main Wiring
Harness-to-A1 Display Panel
X10— W1 Main Wiring
Harness-to-A1 Display
Panel

X11— W1 Main Wiring
Harness-to-A1 Display
Panel
Y1— Starting Motor Solenoid

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KN52281,1004467 -19-16JAN13-2/6



LVAL11682—UN—02NOV10

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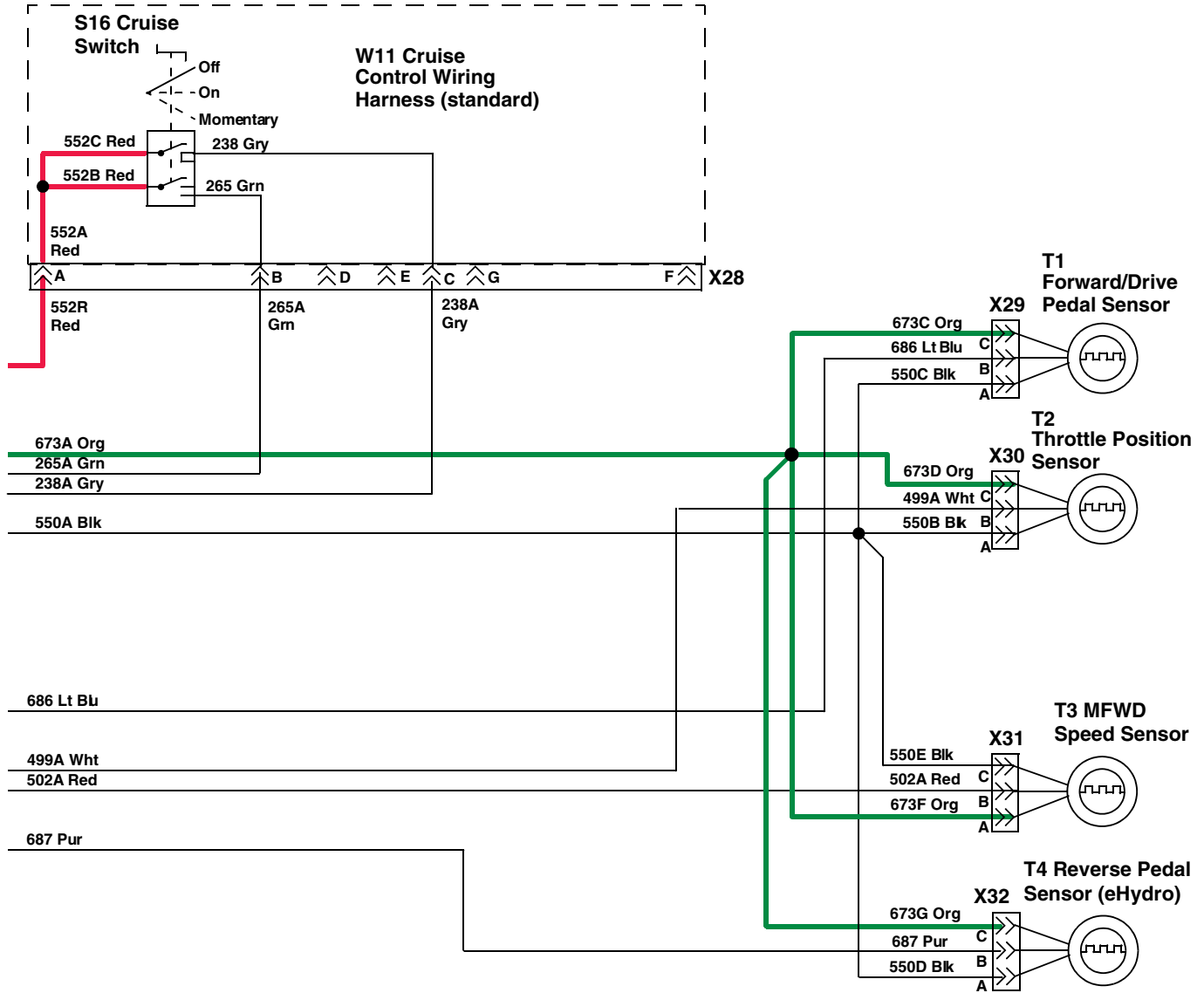
KN52281,1004467 -19-16JAN13-3/6

A2—Electronic Drive Controller	X27— W9 eHydro™ Wiring	Y5— Forward Proportional
S15— Brake Switch	Harness-to-W10	Solenoid
S18— FNR Switch (Auto HST)	Proportional Valve Wiring	
X4—W1 Main Wiring	Harness	
Harness-to-W9 eHydro™	Y4— Reverse Proportional	
Wiring Harness	Solenoid	

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KN52281,1004467 -19-16JAN13-4/6



LVAL11683 —UN—02NOV10

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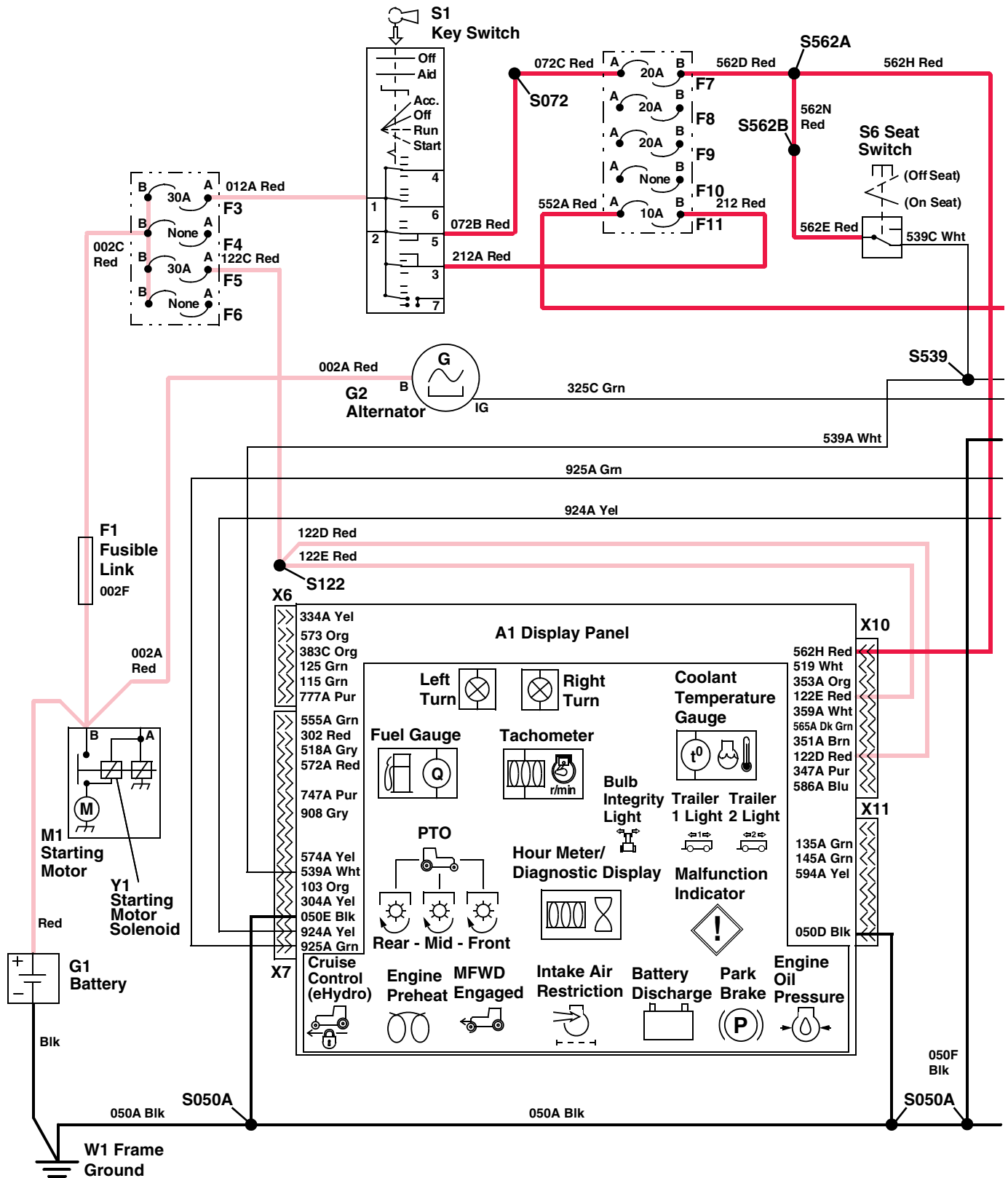
KN52281,1004467 -19-16JAN13-5/6

S16— Cruise Control Switch (standard)	W11— Cruise Control Wiring Harness (standard)	X30— W9 eHydro™ Wiring Harness-to-T2 Throttle Position Sensor
T1— Forward/Drive Pedal Sensor	X28— W9 eHydro™ Wiring Harness-to-W12 Cruise Control Wiring Harness (standard)	X31— W9 eHydro™ Wiring Harness-to-T3 MFWD Speed Sensor
T2— Throttle Position Sensor		X32— W9 eHydro™ Wiring Harness-to-T4 Reverse Pedal Sensor (sensor installed on eHydro™)
T3— MFWD Speed Sensor	X29— W9 eHydro™ Wiring Harness-to-T1 Forward/Drive Pedal Sensor	
T4— Reverse Pedal Sensor (eHydro™)		

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KN52281,1004467 -19-16JAN13-6/6

eHydro™/Auto HST—Cruise Control Circuit Electrical Schematic (Standard)—MY13



LVAL38739 —UN—05DEC12

Continued on next page

KN52281,1004468 -19-16JAN13-1/6

A1—Display Panel
 F1— Fusible Link
 F3— Fuse 30A
 F4— Not Used
 F5— Fuse 30A
 F6— Not Used
 F7— Fuse 20A
 F8— Fuse 20A
 F9— Fuse 20A

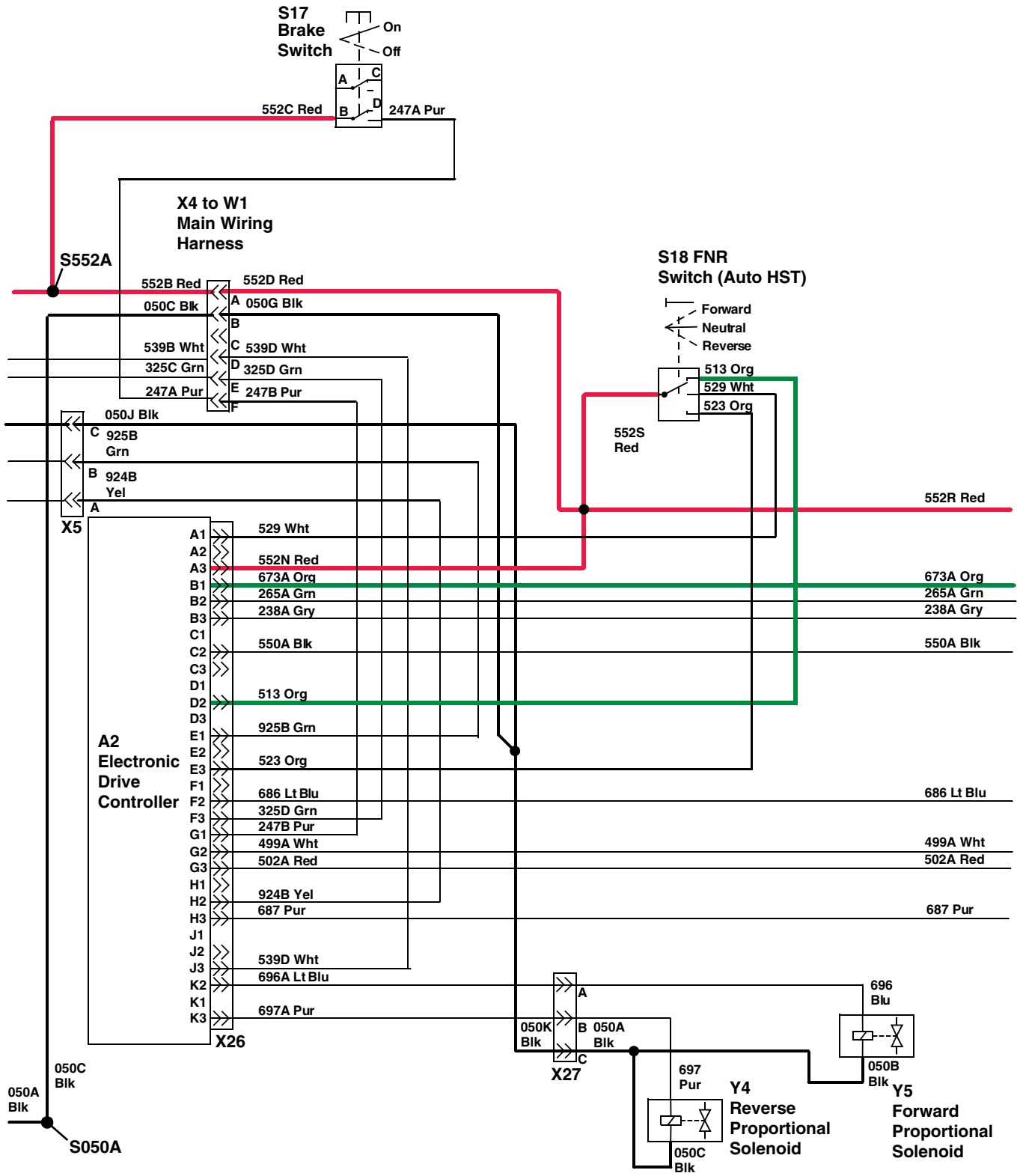
F10— Not Used
 F11— Fuse 10A
 G1—Battery
 G2—Alternator
 M1—Starting Motor
 S1— Key Switch
 S6— Seat Switch
 W1—Frame Ground

X6— W1 Main Wiring
 Harness-to-A1 Display Panel
 X7— W1 Main Wiring
 Harness-to-A1 Display Panel
 X10— W1 Main Wiring
 Harness-to-A1 Display
 Panel

X11— W1 Main Wiring
 Harness-to-A1 Display
 Panel
 Y1— Starting Motor Solenoid

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KN52281,1004468 -19-16JAN13-2/6



LVAL38740—UN—09JAN13

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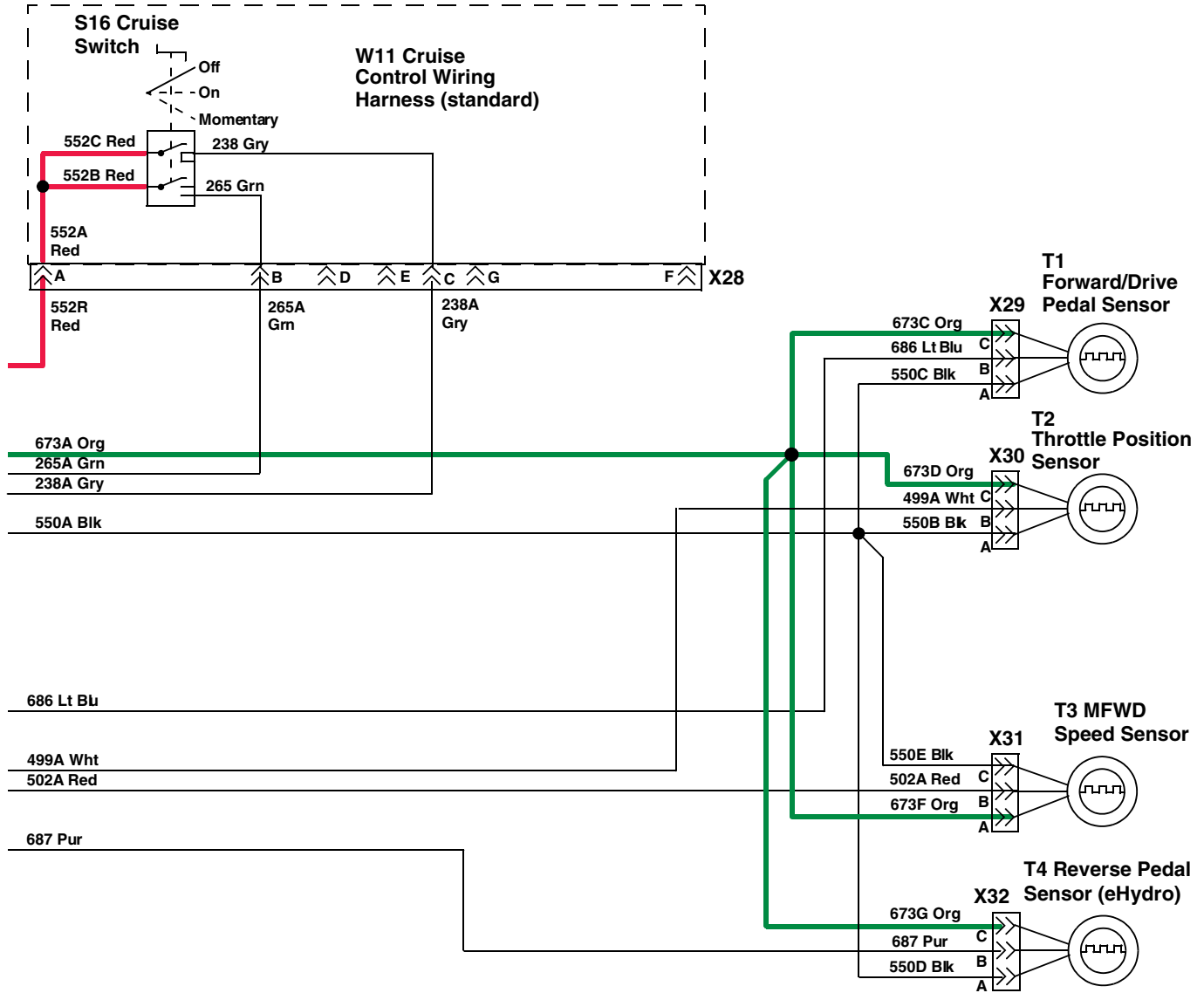
KN52281,1004468 -19-16JAN13-3/6

A2—Electronic Drive Controller	X27— W9 eHydro™/Auto HST	Y5— Forward Proportional
S17— Brake Switch	Wiring Harness-to-W10	Solenoid
S18— FNR Switch (Auto HST)	Proportional Valve Wiring	
X4—W1 Main Wiring	Harness	
Harness-to-W9 eHydro™	Y4— Reverse Proportional	
Wiring Harness	Solenoid	

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KN52281,1004468 -19-16JAN13-4/6



LVAL11683—UN—02NOV10

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KN52281,1004468 -19-16JAN13-5/6

S16— Cruise Control Switch (standard)	W11—Cruise Control Wiring Harness (standard)	X30— W9 eHydro™/Auto HST Wiring Harness-to-T2 Throttle Position Sensor
T1— Forward/Drive Pedal Sensor	X28— W9 eHydro™/Auto HST Wiring Harness-to-W12 Cruise Control Wiring Harness (standard)	X31— W9 eHydro™/Auto HST Wiring Harness-to-T3 MFWD Speed Sensor
T2— Throttle Position Sensor		X32— W9 eHydro™/Auto HST Wiring Harness-to-T4 Reverse Pedal Sensor (eHydro™ only)
T3— MFWD Speed Sensor	X29— W9 eHydro™/Auto HST Wiring Harness-to-T1 Forward/Drive Pedal Sensor	
T4— Reverse Pedal Sensor (eHydro™ only)		

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KN52281,1004468 -19-16JAN13-6/6

eHydro™—Cruise Control Circuit Diagnosis (Standard)—Pre MY08

Test Procedure A

NOTE: Test forward and reverse drive function before testing the cruise control function. Correct all drive function faults before beginning cruise control diagnostics.

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on eHydro™

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models. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.) and see Diagnostic Mode 2 (eHydro™/Auto HST).

Test Conditions:

- Park brake locked.
- Right brake pedal released.
- X26 connector to drive controller disconnected.
- Key switch in the run position, engine not running.

KN52281,1004469 -19-02NOV12-1/8

Cruise Control Circuit

KN52281,1004469 -19-02NOV12-2/8

Step 1

Do any fault codes appear in the LCD display?

YES: Correct the possible faults. (See [Display Panel Fault Codes—Auto HST/eHydro™](#) in Section 40, Group 45.)

NO: Go to next step.

KN52281,1004469 -19-02NOV12-3/8

Step 2

Does machine drive using normal foot pedal operation?

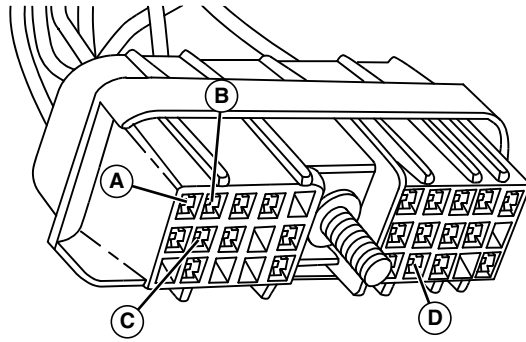
YES: Verify cruise control instructions. See Operators Manual. Go to next step.

NO: Correct the forward and/or reverse circuit operations.

Continued on next page

KN52281,1004469 -19-02NOV12-4/8

Step 3



LVAL11684 —UN—02NOV10

A—X26 Drive Controller Connector, Terminal A3, 552B Red Wire

B—X26 Drive Controller Connector, Terminal B3, 238 Gry Wire

C—X26 Drive Controller Connector, Terminal B2, 265 Grn Wire

D—X26 Drive Controller Connector, Terminal G1, 247 Pur Wire

Disconnect the X26 connector to the drive controller. Is battery voltage present at terminal A3, 552B Red wire (A)?

YES: Go to next step.

NO: Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

KN52281,1004469 -19-02NOV12-5/8

Step 4

Is voltage present at terminal G1, 247 Pur wire (D)?

YES: Test the brake switch. (See [Brake and Park Brake Switch Test](#) in Section 40, Group 40.) Check the 247 Pur wire and connections.

NO: Go to next step.

KN52281,1004469 -19-02NOV12-6/8

Step 5

Place cruise control switch in the on position. Is battery voltage present at terminal B3, 238 Gry wire (B)?

YES: Go to next step.

NO: Test the cruise control switch. (See [Cruise/Max Speed Switch Test—eHydro™/Auto HST](#) in Section 40, Group 40.) Check the 238 Gry wire and connections.

KN52281,1004469 -19-02NOV12-7/8

Step 6

Place cruise control switch in the momentary on position. Is battery voltage present at terminal B3, 238 Gry wire (B) and terminal B2, 265 Grn wire (C)?

YES: Connect the X26 connector to the drive controller. If all the inputs in steps 3 through 6 are correct and the cruise control function does not operate, replace the drive controller.

NO: Test the cruise control switch. Check the 265 Grn wire and connections.

KN52281,1004469 -19-02NOV12-8/8

eHydro™—Cruise Control Circuit Diagnosis (Standard)—MY08

Test Procedure A

NOTE: Test forward and reverse drive function before testing the cruise control function. Correct all drive function faults before beginning cruise control diagnostics.

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on eHydro™

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models. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.) and see Diagnostic Mode 2 (eHydro™/Auto HST).

Test Conditions:

- Park brake locked.
- Right brake pedal released.
- Key switch in the run position, engine not running.

KN52281,100446A -19-02NOV12-1/8

Cruise Control Circuit

KN52281,100446A -19-02NOV12-2/8

Step 1

Do any fault codes appear in the LCD display?

YES: Correct the possible faults. (See [Display Panel Fault Codes—Auto HST/eHydro™](#) in Section 40, Group 45.)

NO: Go to next step.

KN52281,100446A -19-02NOV12-3/8

Step 2

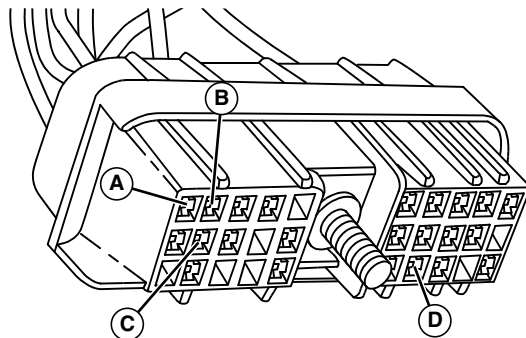
Does machine drive using normal foot pedal operation?

YES: Verify cruise control instructions. See Operators Manual. Go to next step.

NO: Correct the forward and/or reverse circuit operations.

KN52281,100446A -19-02NOV12-4/8

Step 3



LVAL11685 —UN—02NOV10

A—X26 Drive Controller Connector, Terminal A3, 552N Red Wire

B—X26 Drive Controller Connector, Terminal B3, 238A Gry Wire

C—X26 Drive Controller Connector, Terminal B2, 265A Grn Wire

D—X26 Drive Controller Connector, Terminal G1, 247B Pur Wire

Disconnect the X26 connector to the drive controller. Is battery voltage present at terminal A3, 552N Red wire (A)?

YES: Go to next step.

NO: Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

Continued on next page

KN52281,100446A -19-02NOV12-5/8

Step 4	Is voltage present at terminal G1, 247B Pur wire (D)?	<p>YES: Test the brake switch. (See Brake and Park Brake Switch Test in Section 40, Group 40.) Check the 247 series Pur wires and connections.</p> <p>NO: Go to next step.</p> <p>KN52281,100446A -19-02NOV12-6/8</p>
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Step 5	Place cruise control switch in the on position. Is battery voltage present at terminal B3, 238A Gry wire (B)?	<p>YES: Go to next step.</p> <p>NO: Test the cruise control switch. (See Cruise/Max Speed Switch Test—eHydro™/Auto HST in Section 40, Group 40.) Check the 238 series Gry wires and connections.</p> <p>KN52281,100446A -19-02NOV12-7/8</p>
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Step 6	Place cruise control switch in the momentary on position. Is battery voltage present at terminal B3, 238A Gry wire (B) and terminal B2, 265A Grn wire (C)?	<p>YES: Connect the X26 connector to the drive controller. If all the inputs in steps 3 through 6 are correct and the cruise control function does not operate, replace the drive controller.</p> <p>NO: Test the cruise control switch. Check the 265 series Grn wires and connections.</p> <p>KN52281,100446A -19-02NOV12-8/8</p>
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eHydro™—Cruise Control Circuit Diagnosis (Standard)—MY13

Test Procedure A

NOTE: Test forward and reverse drive function before testing the cruise control function. Correct all drive function faults before beginning cruise control diagnostics.

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on eHydro™

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models. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 50.) and see Diagnostic Mode 2 (eHydro™/Auto HST).

Test Conditions

- Park brake locked.
- Right brake pedal released.
- Key switch in the run position, engine not running.

KN52281,100446B -19-21JAN13-1/8

Cruise Control Circuit

Continued on next page

KN52281,100446B -19-21JAN13-2/8

Step 1	Do any fault codes appear in the LCD display?	<p>YES: Correct the possible faults. (See Display Panel Fault Codes—Auto HST/eHydro™ in Section 40, Group 50.)</p> <p>NO: Go to next step.</p>
KN52281,100446B -19-21JAN13-3/8		
Step 2	Does machine drive using normal foot pedal operation?	<p>YES: Verify cruise control instructions. See Operators Manual. Go to next step.</p> <p>NO: Correct the forward and/or reverse circuit operations.</p>
KN52281,100446B -19-21JAN13-4/8		
Step 3	<div> </div> <p>LVAL11685 —UN—02NOV10</p> <p>A—X26 Drive Controller Connector, Terminal A3, 552N Red Wire B—X26 Drive Controller Connector, Terminal B3, 238A Gry Wire C—X26 Drive Controller Connector, Terminal B2, 265A Grn Wire D—X26 Drive Controller Connector, Terminal G1, 247B Pur Wire</p> <p>Disconnect the X26 connector to the drive controller. Is battery voltage present at terminal A3, 552N Red wire (A)?</p>	<p>YES: Go to next step.</p> <p>NO: Test the switched power circuit. (See Power Circuit Diagnosis—MY13—NA in Section 40, Group 40.)</p>
KN52281,100446B -19-21JAN13-5/8		
Step 4	Is voltage present at terminal G1, 247B Pur wire (D)?	<p>YES: Test the brake switch. (See Brake and Park Brake Switch Test in Section 40, Group 45.) Check the 247 series Pur wires and connections.</p> <p>NO: Go to next step.</p>
Continued on next page		
KN52281,100446B -19-21JAN13-6/8		

Step 5	Place cruise control switch in the on position. Is battery voltage present at terminal B3, 238A Gry wire (B)?	<p>YES: Go to next step.</p> <p>NO: Test the cruise control switch. (See Cruise/Max Speed Switch Test—eHydro™/Auto HST in Section 40, Group 45.) Check the 238 series Gry wires and connections.</p>
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KN52281,100446B -19-21JAN13-7/8

Step 6	Place cruise control switch in the momentary on position. Is battery voltage present at terminal B3, 238A Gry wire (B) and terminal B2, 265A Grn wire (C)?	<p>YES: Connect the X26 connector to the drive controller. If all the inputs in steps 3 through 6 are correct and the cruise control function does not operate, replace the drive controller.</p> <p>NO: Test the cruise control switch. Check the 265 series Grn wires and connections.</p>
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KN52281,100446B -19-21JAN13-8/8

Auto HST—Cruise Control Circuit Diagnosis (Standard)

Test Procedure A

NOTE: Test forward and reverse drive function before testing the cruise control function. Correct all drive function faults before beginning cruise control diagnostics.

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on Auto HST

models. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.) and see Diagnostic Mode 2 (eHydro™/Auto HST).

Test Conditions:

- Park brake locked.
- Brake pedal released.
- X26 connector to drive controller disconnected.
- Key switch in the run position, engine not running.

KN52281,100446C -19-02NOV12-1/8

Cruise Control Circuit

KN52281,100446C -19-02NOV12-2/8

Step 1	Do any fault codes appear in the LCD display?	<p>YES: Correct the possible faults. (See Display Panel Fault Codes—Auto HST/eHydro™ in Section 40, Group 45.)</p> <p>NO: Go to next step.</p>
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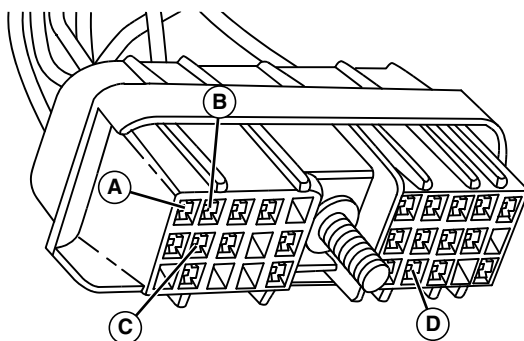
KN52281,100446C -19-02NOV12-3/8

Step 2	Does machine drive using normal drive pedal and FNR switch operation?	<p>YES: Verify cruise control instructions. See Operators Manual. Go to next step.</p> <p>NO: Correct the forward and/or reverse circuit operations.</p>
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KN52281,100446C -19-02NOV12-4/8

Step 3



LVAL11686 —UN—02NOV10

A—X26 Drive Controller Connector, Terminal A3, 552N Red Wire

B—X26 Drive Controller Connector, Terminal B3, 238A Gry Wire

C—X26 Drive Controller Connector, Terminal B2, 265A Grn Wire

D—X26 Drive Controller Connector, Terminal G1, 247B Pur Wire

Disconnect the X26 connector to the drive controller. Is battery voltage present at terminal A3, 552N Red wire (A)?

YES: Go to next step.

NO: Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

KN52281,100446C -19-02NOV12-5/8

Step 4

Is voltage present at terminal G1, 247B Pur wire (D)?

YES: Test the brake switch. (See [Brake and Park Brake Switch Test](#) in Section 40, Group 40.) Check the 247B Pur wire and connections.

NO: Go to next step.

KN52281,100446C -19-02NOV12-6/8

Step 5

Place cruise control switch in the on position. Is battery voltage present at terminal B3, 238A Gry wire (B)?

YES: Go to next step.

NO: Test the cruise control switch. (See [Cruise/Max Speed Switch Test—eHydro™/Auto HST](#) in Section 40, Group 40.) Check the 238A Gry wire and connections.

KN52281,100446C -19-02NOV12-7/8

Step 6

Place cruise control switch in the momentary on position. Is battery voltage present at terminal B3, 238A Gry wire (B) and terminal B2, 265A Grn wire (C)?

YES: Connect the X26 connector to the drive controller. If all the inputs in steps 3 through 6 are correct and the cruise control function does not operate, replace the drive controller.

NO: Test the cruise control switch. Check the 265 Grn wire and connections.

KN52281,100446C -19-02NOV12-8/8

eHydro™—Cruise Control Circuit Operation (Optional)—Pre MY08

Function:

To control the machine's forward drive speed at a constant speed that can be repeated without having to hold the forward drive pedal at that speed.

Operating Conditions:

- Key switch in run position
- Engine running
- Operator on seat
- Park brake unlocked
- Cruise switch on
- Right brake pedal not depressed
- Forward pedal pressed to desired speed while setting the drive speed, and
- Set/- switch pressed momentarily when the desired drive speed is attained.

The cruise control will remain engaged until the right brake is depressed; the key switch is turned to the off position; the reverse pedal is depressed; or, the cruise control switch is placed into the off position.

Theory of Operation:

The cruise control uses the electronic drive controller (drive controller) to allow the operator to set and hold a forward drive speed setting that the operator desires without having to press and hold the forward pedal.

The cruise control circuit uses the forward pedal sensor, alternator, throttle position sensor, and the MFWD speed sensor to provide input to the drive controller. The drive controller then processes these inputs to provide output current to the forward proportional solenoid.

Placing the cruise control switch to the on position, enables the cruise control function. Momentarily pressing the Set/- switch will then set the cruise speed at the speed being traveled.

Once set, the drive controller monitors the machine speed and varies the current to the forward proportional solenoid to maintain travel speed at the set point.

Switched power is provided to the cruise/max speed switch from the key switch, 212 Red, F11 fuse, 552 Red wire in the W1 main wiring harness, X4 connector, 552A and 552D Red wires in the W9 eHydro™ wiring harness, X28 connector, and the 552A and 552C Red wires in the W12 cruise control wiring harness.

The Res/+, Set/- switch receives power from the switched power circuit on 552A and 552B Red wires.

When the cruise/max speed switch is in the on position current is provided from the 552C Red wire across the

switch to the 238 Gry wire of the W12 and W9 wiring harnesses to the A2 drive controller. This input, turns on the logic circuit used to enable the cruise control function.

The next input signal needed to activate the cruise circuit is an input from the forward pedal sensor on wire 686 Lt Blu. This circuit causes an output on the 696 Blu wire to the forward proportional solenoid which in turn causes the machine to move forward.

Once the machine is traveling at the desired speed, momentarily pressing the Res/ +, Set/—switch to the Set/- position supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller. This input will set the cruise speed at the speed being traveled.

At the moment the Set/- switch is pressed the drive controller records the inputs from the forward pedal sensor, alternator, throttle position sensor, and the MFWD speed sensor. The drive controller then supplies an output current to the forward proportional solenoid to maintain the speed recorded at the MFWD speed sensor.

The cruise speed setting can be increased and decreased while the machine is being driven by momentarily pressing either the Res/+ switch to increase the cruise speed or the Set/- switch to decrease the cruise speed setting.

Pressing Res/+, or Set/- positions of the switch to change the cruise speed setting will become effective immediately without returning to neutral. The increase/decrease amount is a percentage of the actual machine speed.

Pressing the Res/+ side of the switch supplies power from the 552B Red wire across the switch to the 266 Blu wire to the drive controller. Pressing the Set/- side of the switch supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller.

Pressing either the right brake or reverse pedals will disengage the cruise function. The last speed setting is stored in the drive controller and if the operator is pressing the forward pedal, the Res/+ switch can be pressed momentarily to ramp back to the stored speed. Turning the cruise switch off, will disengage the cruise function and erase the stored setting.

If changes in machine loading or range gear position settings do not allow for return to the previous speed setting, the drive controller will attempt to return to the speed setting by sending either the maximum (fastest speed possible) or minimum (slowest speed possible) current to the forward proportional solenoid. If the machine is driving either up or down a grade, the drive controller will increase or decrease the output current to the forward proportional solenoid to maintain the speed at the MFWD speed sensor. If the operator changes the throttle position, the drive controller will again vary the output to the forward proportional solenoid to maintain the drive speed at the MFWD speed sensor.

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KN52281,100446D -19-02NOV12-1/1

Auto HST—Cruise Control Circuit Operation (Optional)—MY08

Function:

To control the machine's forward drive speed at a constant speed that can be repeated without having to hold the forward drive pedal at that speed.

Operating Conditions:

- Key switch in run position
- Engine running
- Operator on seat
- Park brake unlocked
- Cruise switch on
- Brake pedal not depressed
- Drive pedal pressed to desired speed while setting the drive speed, and
- Set/- switch pressed momentarily when the desired drive speed is attained.

The cruise control will remain engaged until the brake is depressed; the key switch is turned to the off position; the FNR switch is placed in either the neutral or reverse positions; or, the cruise control switch is placed into the off position.

Theory of Operation:

The cruise control uses the electronic drive controller (drive controller) to allow the operator to set and hold a forward drive speed setting that the operator desires without having to press and hold the drive pedal.

The cruise control circuit uses the drive pedal sensor, alternator, throttle position sensor, and the MFWD speed sensor to provide input to the drive controller. The drive controller then processes these inputs to provide output current to the forward proportional solenoid.

Placing the cruise control switch to the on position, enables the cruise control function. Momentarily pressing the Set/- switch will then set the cruise speed at the speed being traveled.

Once set, the drive controller monitors the machine speed and varies the current to the forward proportional solenoid to maintain travel speed at the set point.

Switched power is provided to the cruise/max speed switch from the key switch, 212A Red, F11 fuse, 552 series Red wires in the W1 main wiring harness, X4 connector, 552 series Red wires in the W9 eHydro™ wiring harness, X28 connector, and the 552A and 552C Red wires in the W12 cruise control wiring harness.

The Res/+, Set/- switch receives power from the switched power circuit on 552A and 552B Red wires.

When the cruise/max speed switch is in the on position, current is provided from the 552C Red wire across the switch to the 238 series Gry wires of the W12 and W9

wiring harnesses to the A2 drive controller. This input, turns on the logic circuit used to enable the cruise control function.

The next input signal needed to activate the cruise circuit is an input from the drive pedal sensor on the 686 Lt Blu wire. This circuit causes an output on the 696A Lt Blu wire to the forward proportional solenoid which in turn causes the machine to move forward.

Once the machine is traveling at the desired speed, momentarily pressing the Res/+, Set/- switch to the Set/- position supplies power from the 552B Red wire across the switch to the 265 series Grn wires to the drive controller. This input will set the cruise speed at the speed being traveled.

At the moment the Set/- switch is pressed the drive controller records the inputs from the drive pedal sensor, alternator, throttle position sensor, and the MFWD speed sensor. The drive controller then supplies an output current to the forward proportional solenoid to maintain the speed recorded at the MFWD speed sensor.

The cruise speed setting can be increased and decreased while the machine is being driven by momentarily pressing either the Res/+ switch to increase the cruise speed or the Set/- switch to decrease the cruise speed setting.

Pressing Res/+, or Set/- positions of the switch to change the cruise speed setting will become effective immediately without returning to neutral. The increase/decrease amount is a percentage of the actual machine speed.

Pressing the Res/+ side of the switch supplies power from the 552B Red wire across the switch to the 266 series Lt Blu wires to the drive controller. Pressing the Set/- side of the switch supplies power from the 552B Red wire across the switch to the 265 series Grn wires to the drive controller.

Pressing either the brake pedal or placing the FNR switch in either the neutral or reverse position will disengage the cruise function. The last speed setting is stored in the drive controller and if the operator is pressing the drive pedal, the Res/+ switch can be pressed momentarily to ramp back to the stored speed. Turning the cruise switch off, will disengage the cruise function and erase the stored setting.

If changes in machine loading or range gear position settings do not allow for return to the previous speed setting, the drive controller will attempt to return to the speed setting by sending either the maximum (fastest speed possible) or minimum (slowest speed possible) current to the forward proportional solenoid. If the machine is driving either up or down a grade, the drive controller will increase or decrease the output current to the forward proportional solenoid to maintain the speed at the MFWD speed sensor. If the operator changes the throttle position, the drive controller will again vary the output to the forward proportional solenoid to maintain the drive speed at the MFWD speed sensor.

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KN52281,100446E -19-02NOV12-1/1

Auto HST—Cruise Control Circuit Operation (Optional)—MY13

Function

To control the machine's forward drive speed at a constant speed that can be repeated without having to hold the forward drive pedal at that speed.

Operating Conditions

- Key switch in run position
- Engine running
- Operator on seat
- Park brake unlocked
- Cruise switch on
- Brake pedal not depressed
- Drive pedal pressed to desired speed while setting the drive speed, and
- Set/- switch pressed momentarily when the desired drive speed is attained.

The cruise control will remain engaged until the brake is depressed; the key switch is turned to the off position; the FNR switch is placed in either the neutral or reverse positions; or, the cruise control switch is placed into the off position.

Theory of Operation

The cruise control uses the electronic drive controller (drive controller) to allow the operator to set and hold a forward drive speed setting that the operator desires without having to press and hold the drive pedal.

The cruise control circuit uses the drive pedal sensor, alternator, throttle position sensor, and the MFWD speed sensor to provide input to the drive controller. The drive controller then processes these inputs to provide output current to the forward proportional solenoid.

Placing the cruise control switch to the on position, enables the cruise control function. Momentarily pressing the Set/- switch will then set the cruise speed at the speed being traveled.

Once set, the drive controller monitors the machine speed and varies the current to the forward proportional solenoid to maintain travel speed at the set point.

Switched power is provided to the cruise/max speed switch from the key switch, 212A Red, F11 fuse, 552 series Red wires in the W1 main wiring harness, X4 connector, 552 series Red wires in the W9 eHydro™ wiring harness, X28 connector, and the 552A and 552C Red wires in the W12 cruise control wiring harness.

The Res/+, Set/- switch receives power from the switched power circuit on 552A and 552B Red wires.

When the cruise/max speed switch is in the on position, current is provided from the 552C Red wire across the switch to the 238 series Gry wires of the W12 and W9

wiring harnesses to the A2 drive controller. This input, turns on the logic circuit used to enable the cruise control function.

The next input signal needed to activate the cruise circuit is an input from the drive pedal sensor on the 686 Lt Blu wire. This circuit causes an output on the 696A Lt Blu wire to the forward proportional solenoid which in turn causes the machine to move forward.

Once the machine is traveling at the desired speed, momentarily pressing the Res/+, Set/- switch to the Set/- position supplies power from the 552B Red wire across the switch to the 265 series Grn wires to the drive controller. This input will set the cruise speed at the speed being traveled.

At the moment the Set/- switch is pressed the drive controller records the inputs from the drive pedal sensor, alternator, throttle position sensor, and the MFWD speed sensor. The drive controller then supplies an output current to the forward proportional solenoid to maintain the speed recorded at the MFWD speed sensor.

The cruise speed setting can be increased and decreased while the machine is being driven by momentarily pressing either the Res/+ switch to increase the cruise speed or the Set/- switch to decrease the cruise speed setting.

Pressing Res/+, or Set/- positions of the switch to change the cruise speed setting will become effective immediately without returning to neutral. The increase/decrease amount is a percentage of the actual machine speed.

Pressing the Res/+ side of the switch supplies power from the 552B Red wire across the switch to the 266 series Lt Blu wires to the drive controller. Pressing the Set/- side of the switch supplies power from the 552B Red wire across the switch to the 265 series Grn wires to the drive controller.

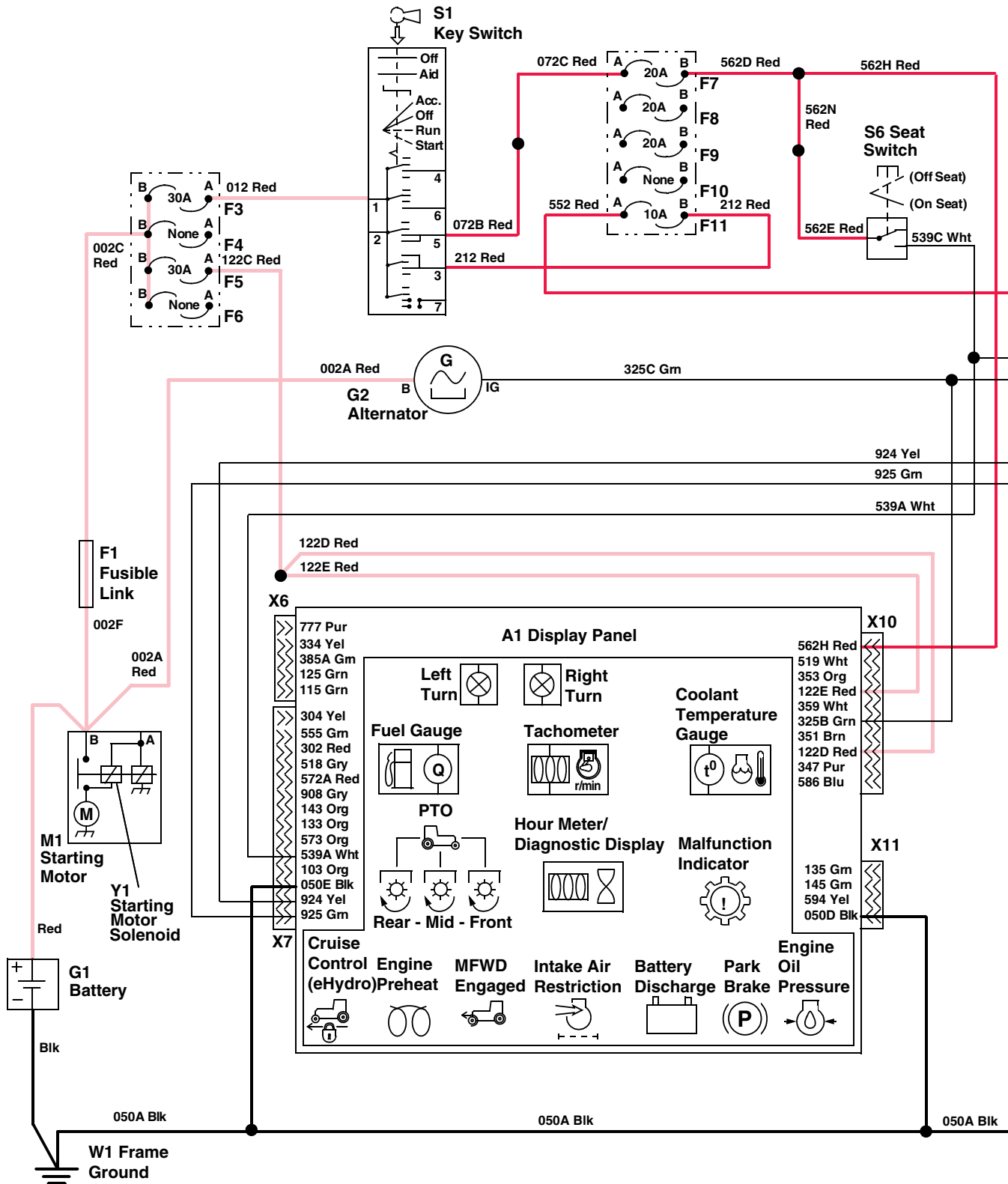
Pressing either the brake pedal or placing the FNR switch in either the neutral or reverse position will disengage the cruise function. The last speed setting is stored in the drive controller and if the operator is pressing the drive pedal, the Res/+ switch can be pressed momentarily to ramp back to the stored speed. Turning the cruise switch off, will disengage the cruise function and erase the stored setting.

If changes in machine loading or range gear position settings do not allow for return to the previous speed setting, the drive controller will attempt to return to the speed setting by sending either the maximum (fastest speed possible) or minimum (slowest speed possible) current to the forward proportional solenoid. If the machine is driving either up or down a grade, the drive controller will increase or decrease the output current to the forward proportional solenoid to maintain the speed at the MFWD speed sensor. If the operator changes the throttle position, the drive controller will again vary the output to the forward proportional solenoid to maintain the drive speed at the MFWD speed sensor.

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KN52281,100446F -19-21JAN13-1/1

eHydro™—Cruise Control Circuit Electrical Schematic (Optional)—Pre MY08



LVAL11687—UN—02NOV10

Continued on next page

KN52281,1004470 -19-02NOV12-1/4

A1—Display Panel
F1— Fusible Link
F3— Fuse 30A
F4— Not Used
F5— Fuse 30A
F6— Not Used
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A

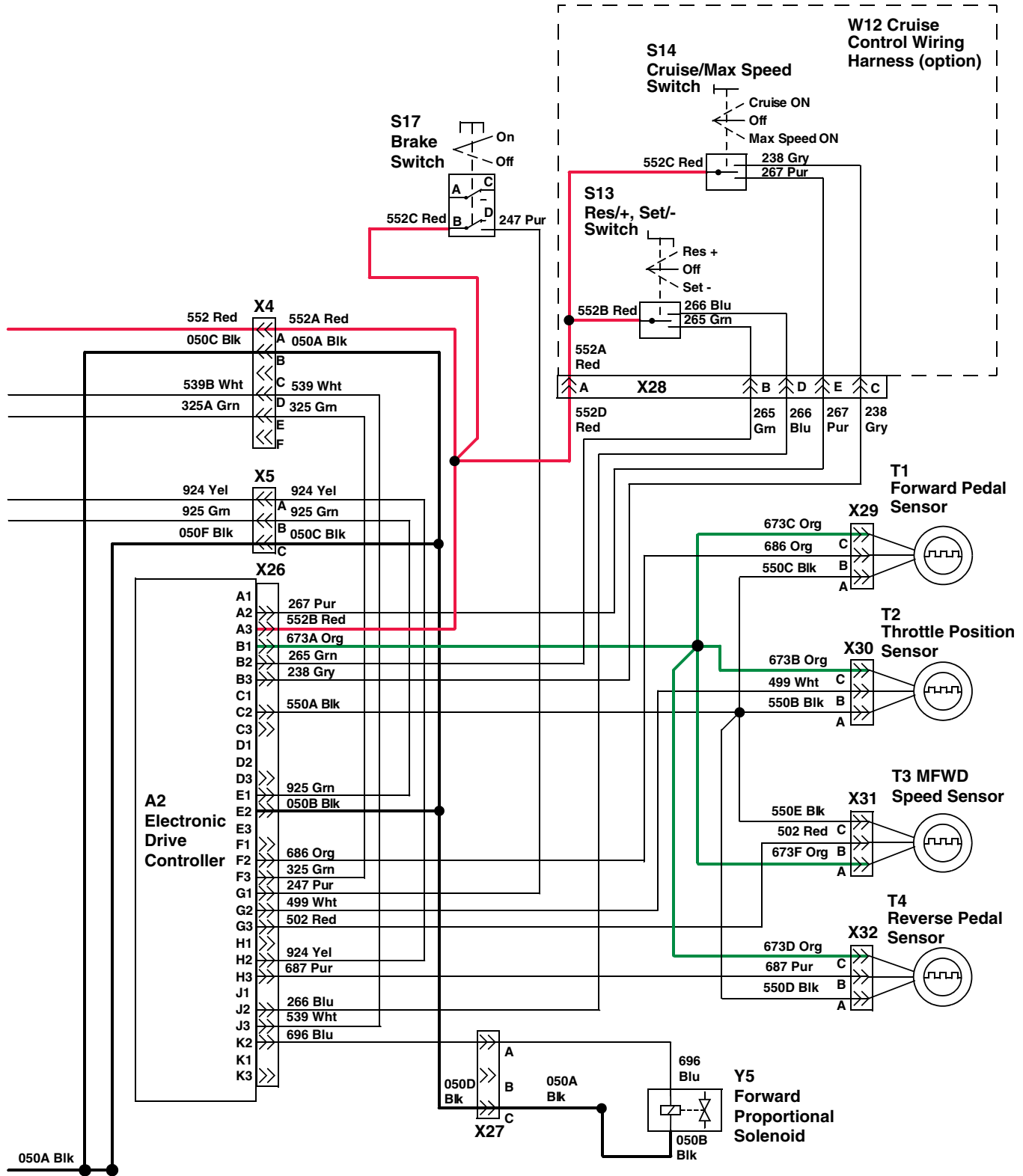
F10— Not Used
F11— Fuse 10A
G1—Battery
G2—Alternator
M1—Starting Motor
S1— Key Switch
S6— Seat Switch
W1—Frame Ground

X6— W1 Main Wiring
Harness-to-A1 Display Panel
X7— W1 Main Wiring
Harness-to-A1 Display Panel
X10— W1 Main Wiring
Harness-to-A1 Display
Panel

X11— W1 Main Wiring
Harness-to-A1 Display
Panel
Y1— Starting Motor Solenoid

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KN52281,1004470 -19-02NOV12-2/4



LVAL11688—UN—02NOV10

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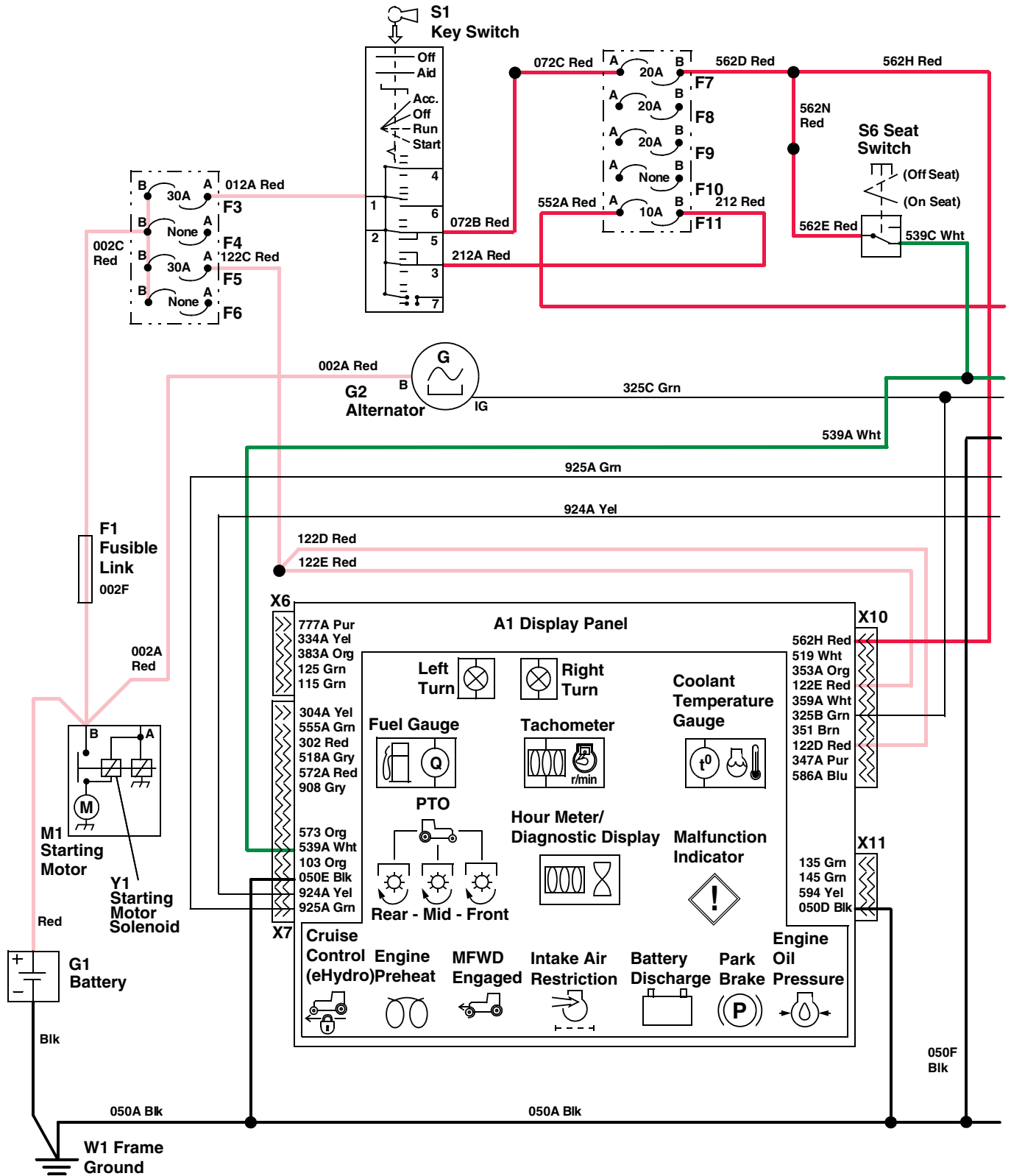
KN52281,1004470 -19-02NOV12-3/4

A2—Electronic Drive Controller	W12—Cruise Control Wiring Harness (optional)	X27— W9 eHydro™ Wiring Harness-to-W10 Proportional Valve Wiring Harness	X32— W9 eHydro™ Wiring Harness-to-T4 Reverse Pedal Sensor (sensor installed on eHydro™)
S13— Res/+, Set/- Switch (optional)	X4— W1 Main Wiring Harness-to-W9 eHydro™/Auto HST Wiring Harness	X28— W9 eHydro™ Wiring Harness-to- W12 Cruise Control Wiring Harness (optional)	Y5— Forward Proportional Solenoid
S14— Cruise Control/Max Speed Switch (optional)	X5— W1 Main Wiring Harness-to-W9 eHydro™ Wiring Harness	X29— W9 eHydro™ Wiring Harness-to-T1 Forward Pedal Sensor	
S17— Brake Switch	X26— W9 eHydro™ Wiring Harness-to-A2 Electronic Drive Controller	X31— W9 eHydro™ Wiring Harness-to-T3 MFWD Speed Sensor	
T1— Forward Pedal Sensor			
T2— Throttle Position Sensor			
T3— MFWD Speed Sensor			
T4— Reverse Pedal Sensor			

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KN52281,1004470 -19-02NOV12-4/4

eHydro™/Auto HST—Cruise Control Circuit Electrical Schematic (Optional)—MY08



LVAL11689 —UN—02NOV10

Continued on next page

KN52281,1004471 -19-02NOV12-1/6

A1—Display Panel
F1— Fusible Link
F3— Fuse 30A
F4— Not Used
F5— Fuse 30A
F6— Not Used
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A

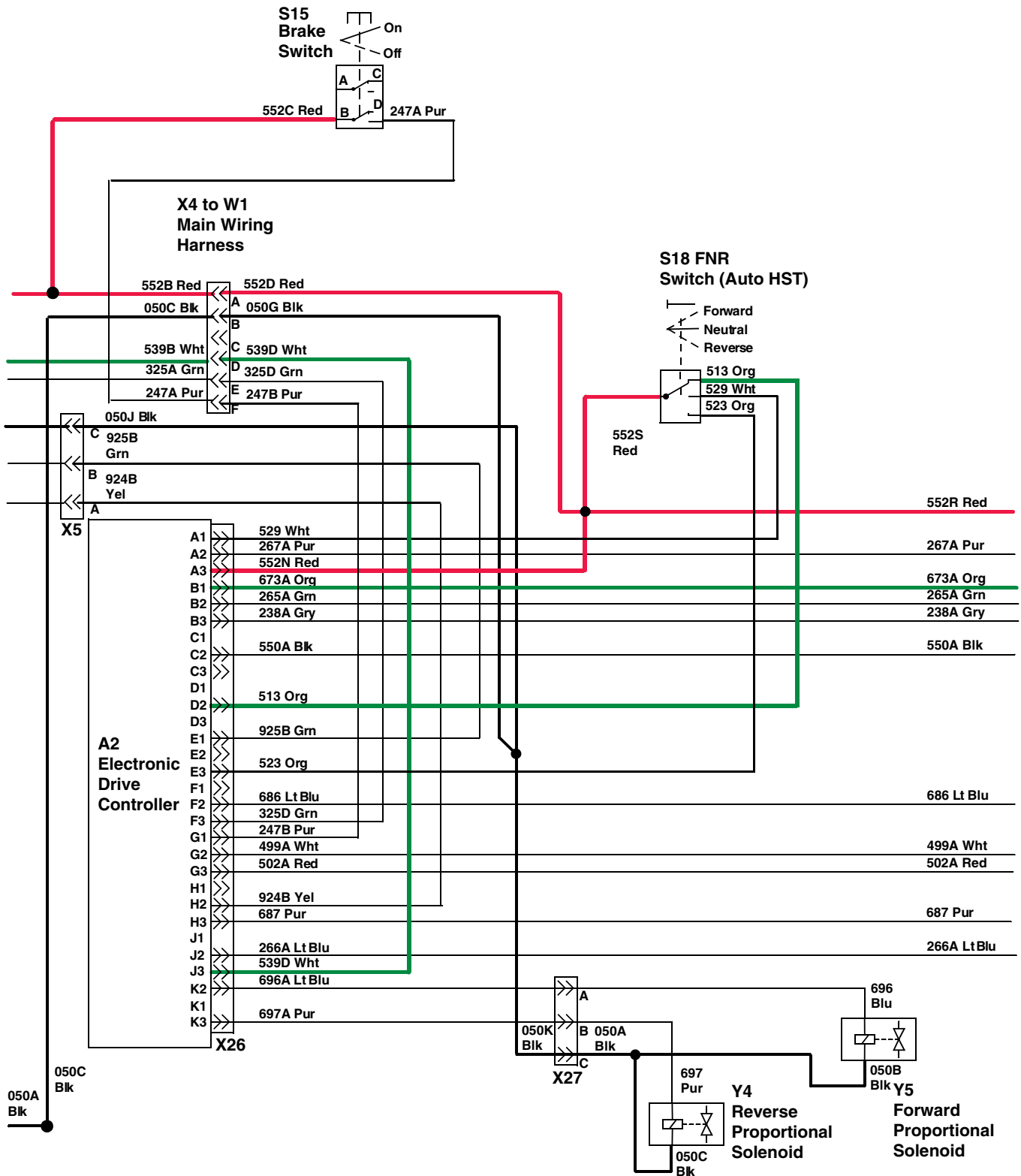
F10— Not Used
F11— Fuse 10A
G1—Battery
G2—Alternator
M1—Starting Motor
S1— Key Switch
S6— Seat Switch
W1—Frame Ground

X6— W1 Main Wiring
Harness-to-A1 Display Panel
X7— W1 Main Wiring
Harness-to-A1 Display Panel
X10— W1 Main Wiring
Harness-to-A1 Display
Panel

X11— W1 Main Wiring
Harness-to-A1 Display
Panel
Y1— Starting Motor Solenoid

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KN52281,1004471 -19-02NOV12-2/6



LVAL11690—UN—02NOV10

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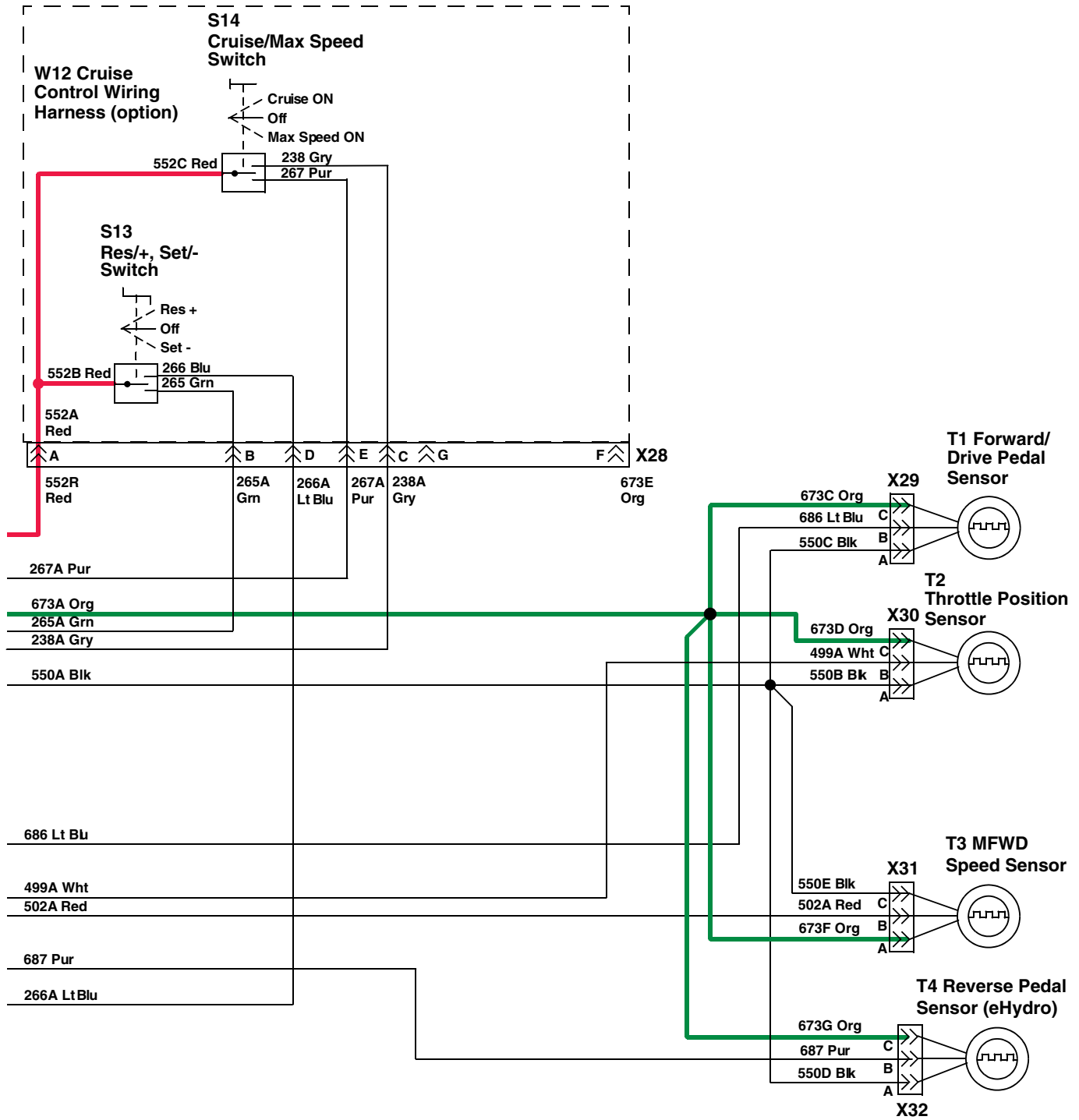
KN52281,1004471 -19-02NOV12-3/6

A2—Electronic Drive Controller	X5—W1 Main Wiring	X27— W9 eHydro™ Wiring
S15— Brake Switch	Harness-to-W9 eHydro™	Harness-to-W10
S18— FNR Switch (Auto HST)	Wiring Harness	Proportional Valve Wiring
X4—W1 Main Wiring Harness-	X26— W9 eHydro™ Wiring	Harness
to-W9 eHydro™/Auto HST	Harness-to-A2 Electronic	Y4—Reverse Proportional
Wiring Harness	Drive Controller	Solenoid
		Y5—Forward Proportional
		Solenoid

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KN52281,1004471 -19-02NOV12-4/6



LVAL11691—UN—02NOV10

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KN52281,1004471 -19-02NOV12-5/6

S13— Res/+, Set/- Switch (optional)	T4— Reverse Pedal Sensor (eHydro™)	X29— W9 eHydro™ Wiring Harness-to-T1 Forward/Drive Pedal Sensor	X32— W9 eHydro™ Wiring Harness-to-T4 Reverse Pedal Sensor (sensor installed on eHydro™)
S14— Cruise Control/Max Speed Switch (optional)	X28— W9 eHydro™ Wiring Harness-to-W11 Cruise Control Wiring Harness (optional)	X30— W9 eHydro™ Wiring Harness-to-T2 Throttle Position Sensor	
T1— Forward/Drive Pedal Sensor		X31— W9 eHydro™ Wiring Harness-to-T3 MFWD Speed Sensor	
T2— Throttle Position Sensor			
T3— MFWD Speed Sensor			

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KN52281,1004471 -19-02NOV12-6/6

A1—Display Panel
F1— Fusible Link
F3— Fuse 30A
F4— Not Used
F5— Fuse 30A
F6— Not Used
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A

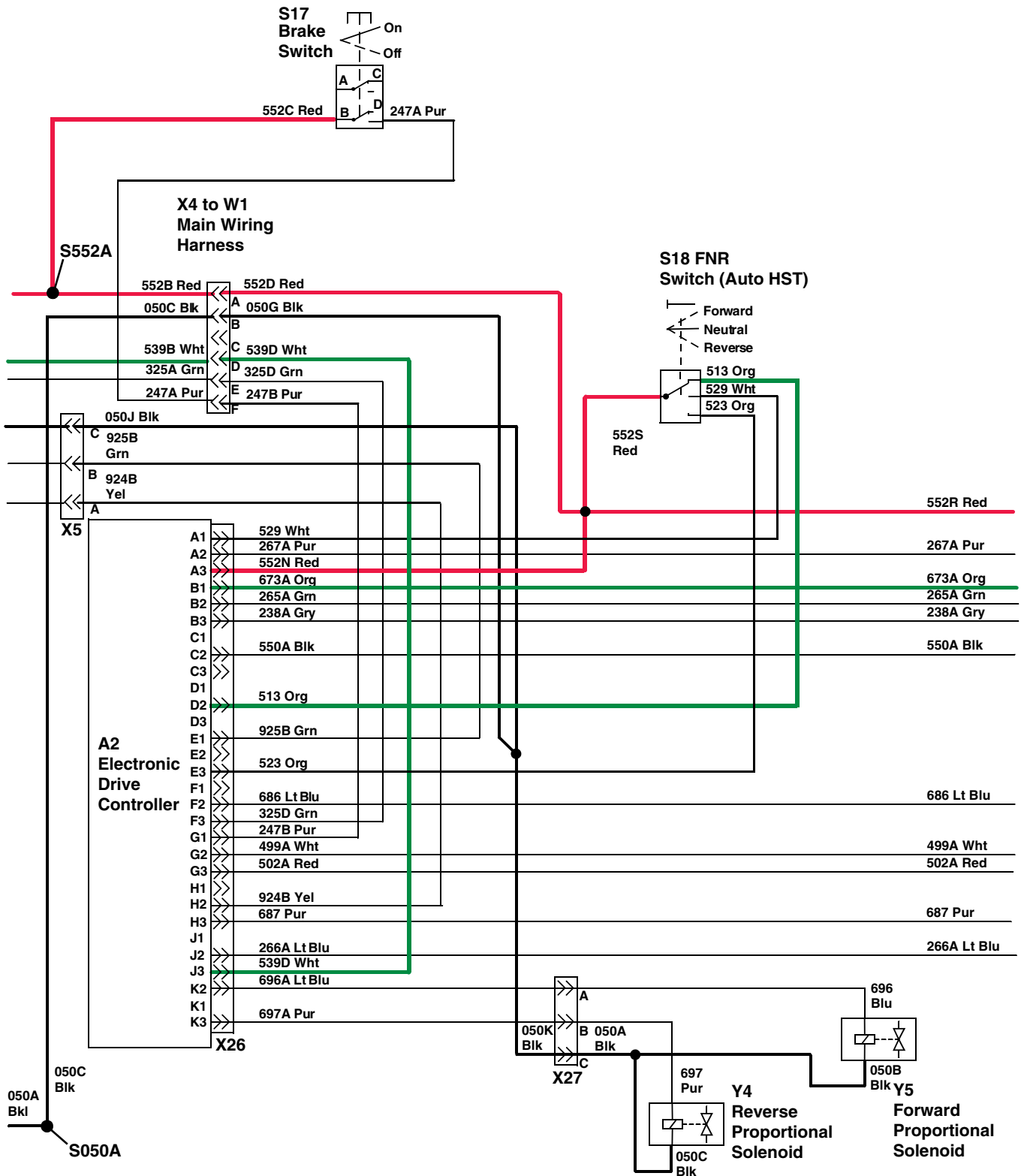
F10— Not Used
F11— Fuse 10A
G1—Battery
G2—Alternator
M1—Starting Motor
S1— Key Switch
S6— Seat Switch
W1—Frame Ground

X6— W1 Main Wiring
Harness-to-A1 Display Panel
X7— W1 Main Wiring
Harness-to-A1 Display Panel
X10— W1 Main Wiring
Harness-to-A1 Display
Panel

X11— W1 Main Wiring
Harness-to-A1 Display
Panel
Y1— Starting Motor Solenoid

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KN52281,1004472 -19-10DEC12-2/6



LVAL38801—UN—09JAN13

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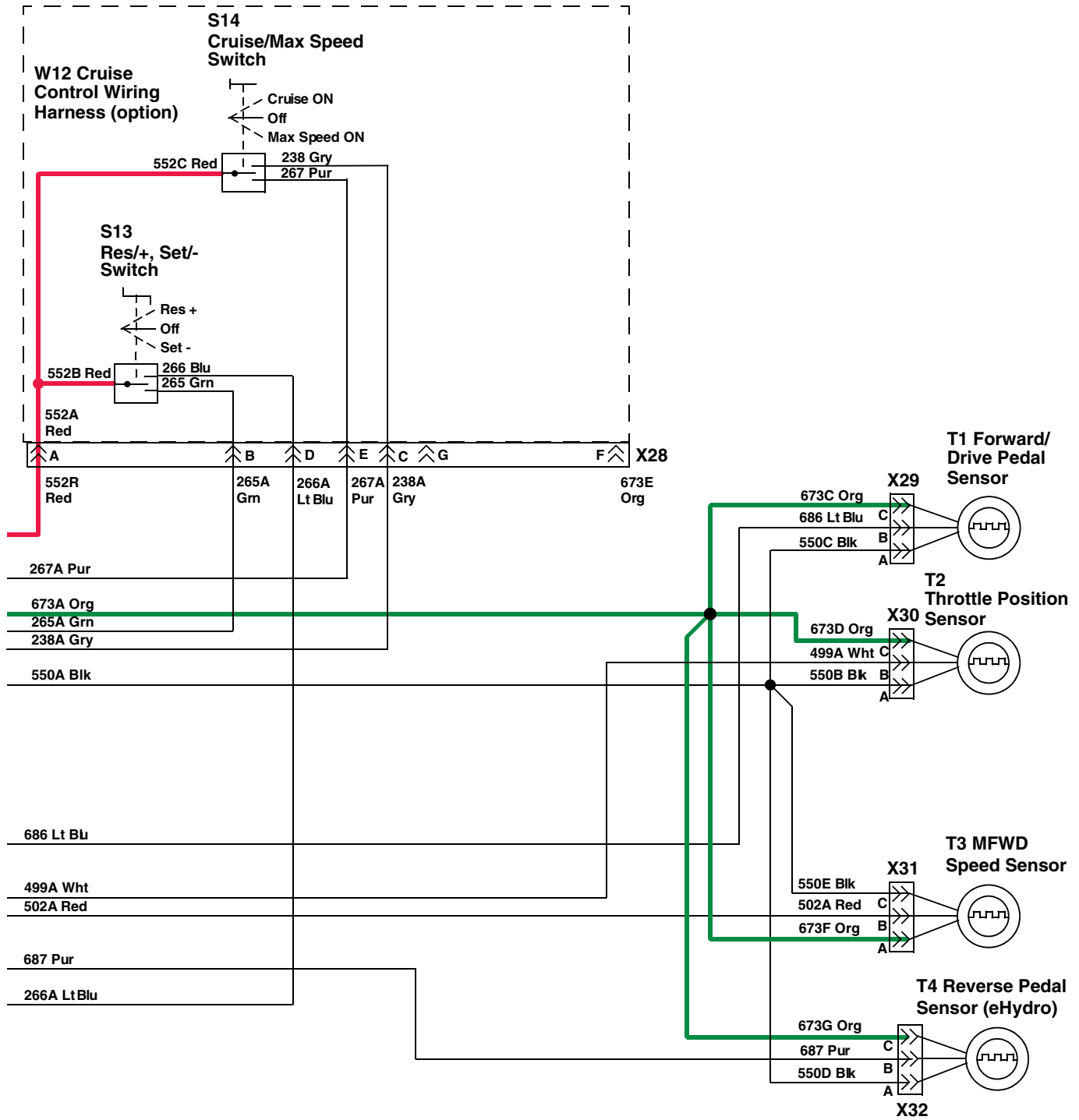
KN52281,1004472 -19-10DEC12-3/6

A2—Electronic Drive Controller	X5—W1 Main Wiring	X27— W9 eHydro™ Wiring
S15— Brake Switch	Harness-to-W9 eHydro™	Harness-to-W10
S18— FNR Switch (Auto HST)	Wiring Harness	Proportional Valve Wiring
X4—W1 Main Wiring Harness-	X26— W9 eHydro™ Wiring	Harness
to-W9 eHydro™/Auto HST	Harness-to-A2 Electronic	Y4—Reverse Proportional
Wiring Harness	Drive Controller	Solenoid
		Y5—Forward Proportional
		Solenoid

eHydro is a trademark of Deere & Company

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KN52281,1004472 -19-10DEC12-4/6



LVAL11691—UN—02NOV10

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KN52281,1004472 -19-10DEC12-5/6

S13— Res/+, Set/- Switch (optional)	T4— Reverse Pedal Sensor (eHydro™)	X29— W9 eHydro™ Wiring Harness-to-T1 Forward/Drive Pedal Sensor	X32— W9 eHydro™ Wiring Harness-to-T4 Reverse Pedal Sensor (sensor installed on eHydro™)
S14— Cruise Control/Max Speed Switch (optional)	X28— W9 eHydro™ Wiring Harness-to-W11 Cruise Control Wiring Harness (optional)	X30— W9 eHydro™ Wiring Harness-to-T2 Throttle Position Sensor	
T1— Forward/Drive Pedal Sensor		X31— W9 eHydro™ Wiring Harness-to-T3 MFWD Speed Sensor	
T2— Throttle Position Sensor			
T3— MFWD Speed Sensor			

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KN52281,1004472 -19-10DEC12-6/6

eHydro™—Cruise Control Circuit Diagnosis (Optional)

Test Procedure A

NOTE: Test forward and reverse drive function before testing the cruise control function. Correct all drive function faults before beginning cruise control diagnostics.

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on eHydro™

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models. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.) and see Diagnostic Mode 2 (eHydro™/Auto HST).

Test Conditions:

- Park brake locked.
- Right brake pedal released.
- Key switch in the run position, engine not running.

KN52281,1004473 -19-02NOV12-1/11

Cruise/Max Speed Circuit

KN52281,1004473 -19-02NOV12-2/11

Step 1

Do any fault codes appear in the LCD display?

YES: Correct the possible faults. (See [Display Panel Fault Codes—Auto HST/eHydro™](#) in Section 40, Group 45.)

NO: Go to next step.

KN52281,1004473 -19-02NOV12-3/11

Step 2

Does machine drive using normal foot pedal operation?

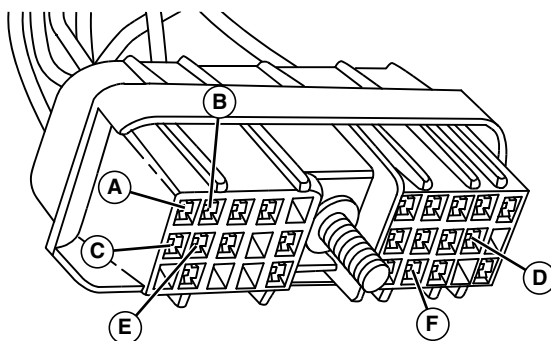
YES: Verify cruise control instructions. See Operators Manual. Go to next step.

NO: Correct the forward and/or reverse circuit operations.

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KN52281,1004473 -19-02NOV12-4/11

Step 3



LVAL11692 —UN—02NOV10

A—X26 Drive Controller Connector, terminal A3, 552 Red Wire

B—X26 Drive Controller Connector, terminal B3, 238 Gry Wire

C—X26 Drive Controller Connector, terminal A2, 267 Pur Wire

D—X26 Drive Controller Connector, terminal J2, 266 Blu Wire

E—X26 Drive Controller Connector, terminal B2, 265 Grn Wire

F—X26 Drive Controller Connector, terminal G1, 247 Pur Wire

Turn off key switch. Disconnect the X26 connector to the drive controller. Turn key switch to run, engine off. Is battery voltage present at terminals A3, 552 series Red wire (A)?

YES: Go to next step.

NO: Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

KN52281,1004473 -19-02NOV12-5/11

Step 4

Is voltage present at terminal G1, 247 Pur wire (F)?

YES: Test the brake switch. (See [Brake and Park Brake Switch Test](#) in Section 40, Group 40.) Check the 247 Pur wire and connections.

NO: Go to next step.

KN52281,1004473 -19-02NOV12-6/11

Step 5

Place cruise/max speed switch in the cruise on position. Is battery voltage present at terminal B3, 238 series Gry wire (B)?

YES: Go to next step.

NO: Test the cruise/max speed switch. (See [Cruise/Max Speed Switch Test—eHydro™/Auto HST](#) in Section 40, Group 40.) Check the 238 series Gry wire and connections.

KN52281,1004473 -19-02NOV12-7/11

Step 6

Place cruise/max speed switch in the max speed on position. Is battery voltage present at terminal A2, 267 series Pur wire (C)?

YES: Go to next step.

NO: Test the cruise/max speed switch. (See [Cruise/Max Speed Switch Test—eHydro™/Auto HST](#) in Section 40, Group 40.) Check the 267 series Pur wire and connections.

Continued on next page

KN52281,1004473 -19-02NOV12-8/11

Step 7

Press and hold the Res/+, Set/- switch in the Res/+ position during the test. Is battery voltage present at terminal J2, 266 series Blu wire (D)?

YES: Go to next step.

NO: Test the Res/+, Set/- speed switch. (See [Res/+, Set/- Switch Test—eHydro™/Auto HST](#) in Section 40, Group 40.) Check the 266 series Blu wire and connections.

KN52281,1004473 -19-02NOV12-9/11

Step 8

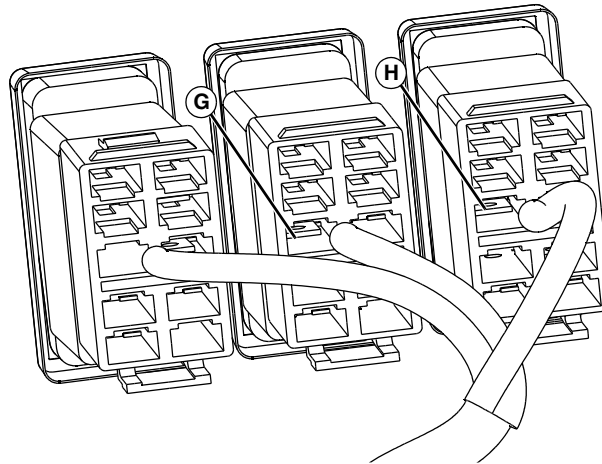
Press and hold the Res/+, Set/- switch in the Set/- position during the test. Is battery voltage present at terminal B2, 265 Grn wire (E)?

YES: Connect the X26 connector to the drive controller. If all the inputs in steps 3 through 8 are correct and the cruise control or max speed functions do not operate, replace the drive controller.

NO: Test the Res/+, Set/- speed switch. (See [Res/+, Set/- Switch Test—eHydro™/Auto HST](#) in Section 40, Group 40.) Check the 265 Grn wire and connections.

KN52281,1004473 -19-02NOV12-10/11

Step 9



LVAL11693 —UN—02NOV10

G—552B Red Wire

H—552C Red Wire

Is battery voltage present at the 552B Red (G) and 552C Red (H) wires?

YES: If normal drive operates, but, cruise control or max speed do not, replace drive controller.

NO: Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

KN52281,1004473 -19-02NOV12-11/11

eHydro™—Cruise Control Circuit Diagnosis (Optional)—MY13

Test Procedure A

NOTE: Test forward and reverse drive function before testing the cruise control function. Correct all drive function faults before beginning cruise control diagnostics.

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on eHydro™

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models. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 50.) and see Diagnostic Mode 2 (eHydro™/Auto HST).

Test Conditions

- Park brake locked.
- Right brake pedal released.
- Key switch in the run position, engine not running.

KN52281,1004474 -19-21JAN13-1/11

Cruise/Max Speed Circuit

KN52281,1004474 -19-21JAN13-2/11

Step 1

Do any fault codes appear in the LCD display?

YES: Correct the possible faults. (See [Display Panel Fault Codes—Auto HST/eHydro™](#) in Section 40, Group 50.)

NO: Go to next step.

KN52281,1004474 -19-21JAN13-3/11

Step 2

Does machine drive using normal foot pedal operation?

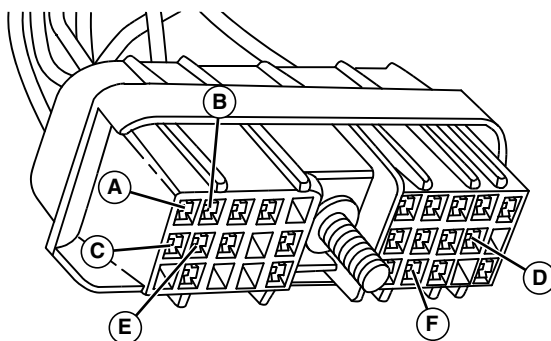
YES: Verify cruise control instructions. See Operators Manual. Go to next step.

NO: Correct the forward and/or reverse circuit operations.

Continued on next page

KN52281,1004474 -19-21JAN13-4/11

Step 3



LVAL11692 —UN—02NOV10

A—X26 Drive Controller Connector, terminal A3, 552N Red Wire

B—X26 Drive Controller Connector, terminal B3, 238A Gry Wire

C—X26 Drive Controller Connector, terminal A2, 267A Pur Wire

D—X26 Drive Controller Connector, terminal J2, 266A Blu Wire

E—X26 Drive Controller Connector, terminal B2, 265A Grn Wire

F—X26 Drive Controller Connector, terminal G1, 247B Pur Wire

Turn off key switch. Disconnect the X26 connector to the drive controller. Turn key switch to run, engine off. Is battery voltage present at terminals A3, 552N series Red wire (A)?

YES: Go to next step.

NO: Test the switched power circuit. (See [Power Circuit Diagnosis—MY13—NA](#) in Section 40, Group 40.)

KN52281,1004474 -19-21JAN13-5/11

Step 4

Is voltage present at terminal G1, 247B Pur wire (F)?

YES: Test the brake switch. (See [Brake and Park Brake Switch Test](#) in Section 40, Group 45.) Check the 247 Pur wire and connections.

NO: Go to next step.

KN52281,1004474 -19-21JAN13-6/11

Step 5

Place cruise/max speed switch in the cruise on position. Is battery voltage present at terminal B3, 238A series Gry wire (B)?

YES: Go to next step.

NO: Test the cruise/max speed switch. (See [Cruise/Max Speed Switch Test—eHydro™/Auto HST](#) in Section 40, Group 45.) Check the 238 series Gry wire and connections.

KN52281,1004474 -19-21JAN13-7/11

Step 6

Place cruise/max speed switch in the max speed on position. Is battery voltage present at terminal A2, 267A series Pur wire (C)?

YES: Go to next step.

NO: Test the cruise/max speed switch. (See [Cruise/Max Speed Switch Test—eHydro™/Auto HST](#) in Section 40, Group 45.) Check the 267 series Pur wire and connections.

Continued on next page

KN52281,1004474 -19-21JAN13-8/11

Step 7

Press and hold the Res/+, Set/- switch in the Res/+ position during the test. Is battery voltage present at terminal J2, 266A series Blu wire (D)?

YES: Go to next step.

NO: Test the Res/+, Set/- speed switch.
(See [Res/+, Set/- Switch Test—eHydro™/Auto HST](#) in Section 40, Group 45.)
Check the 266 series Blu wire and connections.

KN52281,1004474 -19-21JAN13-9/11

Step 8

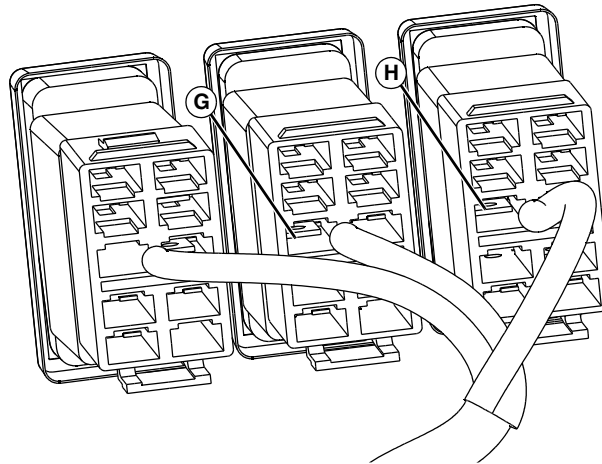
Press and hold the Res/+, Set/- switch in the Set/- position during the test. Is battery voltage present at terminal B2, 265A Grn wire (E)?

YES: Connect the X26 connector to the drive controller. If all the inputs in steps 3 through 8 are correct and the cruise control or max speed functions do not operate, replace the drive controller.

NO: Test the Res/+, Set/- speed switch.
(See [Res/+, Set/- Switch Test—eHydro™/Auto HST](#) in Section 40, Group 45.)
Check the 265 Grn wire and connections.

KN52281,1004474 -19-21JAN13-10/11

Step 9



LVAL11693 —UN—02NOV10

G—552B Red Wire

H—552C Red Wire

Is battery voltage present at the 552B Red (G) and 552C Red (H) wires?

YES: If normal drive operates, but, cruise control or max speed do not, replace drive controller.

NO: Test the switched power circuit.
(See [Power Circuit Diagnosis—MY13—NA](#) in Section 40, Group 40.)

KN52281,1004474 -19-21JAN13-11/11

Auto HST—Cruise Control Circuit Diagnosis (Optional)

Test Procedure A

NOTE: Test forward and reverse drive function before testing the cruise control function. Correct all drive function faults before beginning cruise control diagnostics.

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on Auto HST models. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.) and see Diagnostic Mode 2 (eHydro™/Auto HST).

Test Conditions:

- Park brake locked.
- Brake pedal released.
- Key switch in the run position, engine not running.

KN52281,1004475 -19-02NOV12-1/11

Cruise/Max Speed Circuit

KN52281,1004475 -19-02NOV12-2/11

Step 1

Do any fault codes appear in the LCD display?

YES: Correct the possible faults. (See [Display Panel Fault Codes—Auto HST/eHydro™](#) in Section 40, Group 45.)

NO: Go to next step.

KN52281,1004475 -19-02NOV12-3/11

Step 2

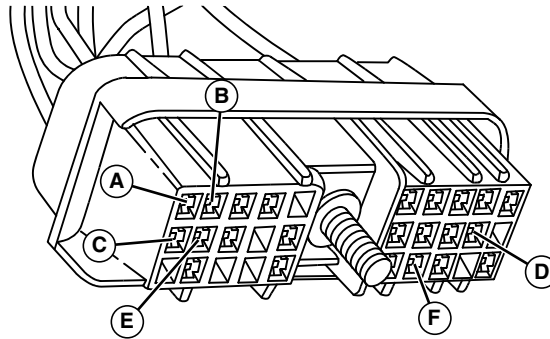
Does machine drive using normal foot pedal and FNR switch operation?

YES: Verify cruise control instructions. See Operators Manual. Go to next step.

NO: Correct the forward and/or reverse circuit operations.

KN52281,1004475 -19-02NOV12-4/11

Step 3



LVAL11694 —UN—02NOV10

- A—X26 Drive Controller Connector, terminal A3, 552N Red Wire
- B—X26 Drive Controller Connector, terminal B3, 238A Gry Wire
- C—X26 Drive Controller Connector, terminal A2, 267A Pur Wire
- D—X26 Drive Controller Connector, terminal J2, 266A Blu Wire
- E—X26 Drive Controller Connector, terminal B2, 265A Grn Wire
- F—X26 Drive Controller Connector, terminal G1, 247B Pur Wire

Turn off key switch. Disconnect the X26 connector to the drive controller. Turn key switch to run, engine off. Is battery voltage present at terminals A3, 552N Red wire (A)?

YES: Go to next step.

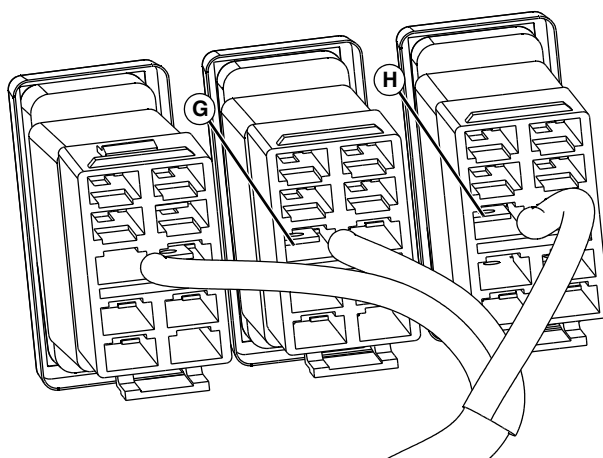
NO: Check 552N Red wire and connections. Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

Continued on next page

KN52281,1004475 -19-02NOV12-5/11

Step 4	Is voltage present at terminal G1, 247B Pur wire (F)?	<p>YES: Test the brake switch. (See Brake and Park Brake Switch Test in Section 40, Group 40.) Check the 247B Pur wire and connections.</p> <p>NO: Go to next step.</p>
KN52281,1004475 -19-02NOV12-6/11		
Step 5	Place cruise/max speed switch in the cruise on position. Is battery voltage present at terminal B3, 238A Gry wire (B)?	<p>YES: Go to next step.</p> <p>NO: Test the cruise/max speed switch. (See Cruise/Max Speed Switch Test—eHydro™/Auto HST in Section 40, Group 40.) Check the 238A Gry wire and connections.</p>
KN52281,1004475 -19-02NOV12-7/11		
Step 6	Place cruise/max speed switch in the max speed on position. Is battery voltage present at terminal A2, 267A Pur wire (C)?	<p>YES: Go to next step.</p> <p>NO: Test the cruise/max speed switch. (See Cruise/Max Speed Switch Test—eHydro™/Auto HST in Section 40, Group 40.) Check the 267A Pur wire and connections.</p>
KN52281,1004475 -19-02NOV12-8/11		
Step 7	Press and hold the Res/+, Set/- switch in the Res/+ position during the test. Is battery voltage present at terminal J2, 266A Lt Blu wire (D)?	<p>YES: Go to next step.</p> <p>NO: Test the Res/+, Set/- speed switch. (See Res/+, Set/- Switch Test—eHydro™/Auto HST in Section 40, Group 40.) Check the 266A Lt Blu wire and connections.</p>
KN52281,1004475 -19-02NOV12-9/11		
Step 8	Press and hold the Res/+, Set/- switch in the Set/- position during the test. Is battery voltage present at terminal B2, 265A Grn wire (E)?	<p>YES: Connect the X26 connector to the drive controller. If all the inputs in steps 3 through 8 are correct and the cruise control or max speed functions do not operate, replace the drive controller.</p> <p>NO: Test the Res/+, Set/- speed switch. (See Res/+, Set/- Switch Test—eHydro™/Auto HST in Section 40, Group 40.) Check the 265A Grn wire and connections.</p>
<div>Continued on next page</div> <div>KN52281,1004475 -19-02NOV12-10/11</div>		

Step 9



LVAL11695 —UN—02NOV10

G—552B Red Wire

H—552C Red Wire

Is battery voltage present at the 552B Red (G) and 552C Red (H) wires?

YES: If normal drive operates, but, cruise control or max speed do not, replace drive controller.

NO: Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

KN52281,1004475 -19-02NOV12-11/11

eHydro™—Load Match and Motion Match Circuit Operation—Pre MY08

Function, Load Match:

To prevent the engine from stalling during heavy loading situations.

Operating Conditions, Load Match:

- Key switch in run position
- Engine running
- Operator on seat
- Park brake unlocked
- Load match switch in the on position
- Machine being driven either forward or reverse

Theory of Operation, Load Match:

Load match is used to eliminate operators stalling the engine during a typical application such as loader work. A throttle position sensor is installed to read the no-load engine rpm set point.

If the engine rpm drops far enough below the set point value, the current sent to the transmission drive valve coils is reduced to allow the engine to recover. The greater the load on the engine, the greater the reduction in current.

If cruise control is active and the load match comes on, the cruise speed output is held at whatever speed it is currently operating at until load match goes back to 100%.

The load match switch can be turned on or off to allow the operator to disable the load match function if desired.

The load match feature will have no effect if the machine is not being driven when the stalling load is being placed on the engine.

Switched power is provided to the load match switch from the key switch, 212 Red, F11 fuse, 552 Red wire in the W1 main wiring harness, X4 connector, 552A and 552E Red wires in the W9 eHydro™ wiring harness, X28 connector, and the 552A and 552C Red wires in the W12 cruise control wiring harness.

When the load match switch is in the on position, power is supplied from the 552E Red wire, across the load match switch to the 268 Gry wire to the drive controller. This enables the load match function to prevent the engine stalling during heavy load applications.

Function, Motion Match:

To allow the operator to change how quickly the pedals respond to being pressed or released.

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Operating Conditions, Motion Match:

- Key switch in run position
- Engine running
- Operator on seat
- Park brake unlocked
- Motion match switch in the on position
- Machine being driven either forward or reverse

Theory of Operation, Motion Match:

Motion Match enables the operator to adjust machine acceleration and deceleration rates.

The rate of acceleration and deceleration is controlled by the drive controller to smoothly ramp the speed up and down. Two different settings provide for either quicker or slower acceleration or deceleration. This operation is controlled by the operator placing the motion match switch in either the on or off position. The change in this setting will take effect as soon as the switch is changed.

Placing the motion match switch in the on position will give the transmission higher response sensitivity to drive pedal movement. Shorter starting and stopping distances can be set for applications requiring rapid changes in direction, such as operating with a loader.

Placing the motion match switch in the off position will give the drive pedals the sensitivity that is typical to most normal operating conditions. Longer starting and stopping distances can be set to avoid turf damage in other applications.

Current is supplied to the A2 electronic drive controller (drive controller) from the switched power circuit. With the key switch in the run position, current is supplied to the 212 Red wire, F11 fuse, 552 Red wire, X4 connector of the W9 wiring harness to the 552A and 552B Red wires and the X26 connector and the drive controller. This circuit powers the drive controller to allow for drive control operation.

The motion match switch receives secondary switched power from the drive controller on 673A, 673E, and 673 Org wires.

When the motion match switch is in the on position, power is supplied from the 673 Org wire, across the motion match switch to the 269 Wht wire to the drive controller. This enables the motion match function for quicker acceleration and deceleration rates.

KN52281,1004476 -19-02NOV12-1/1

eHydro™/Auto HST—Motion Match and Load Match Circuit Operation—MY08

Function, Load Match (eHydro™ only):

To prevent the engine from stalling during heavy loading situations.

Operating Conditions, Load Match (eHydro™ only):

- Key switch in run position
- Engine running
- Operator on seat
- Park brake unlocked
- Load match switch in the on position
- Machine being driven either forward or reverse

Theory of Operation, Load Match (eHydro™ only):

Load match is used to eliminate operators stalling the engine during a typical application such as loader work. A throttle position sensor is installed to read the no-load engine rpm set point.

If the engine rpm drops far enough below the set point value, the current sent to the transmission drive valve coils is reduced to allow the engine to recover. The greater the load on the engine, the greater the reduction in current.

If cruise control is active and the load match comes on, the cruise speed output is held at whatever speed it is currently operating at until load match goes back to 100%.

The load match switch can be turned on or off to allow the operator to disable the load match function if desired.

The load match feature will have no effect if the machine is not being driven when the stalling load is being placed on the engine.

Switched power is provided to the load match switch from the key switch, 212A Red, F11 fuse, 552 series Red wires in the W1 main wiring harness, X4 connector, 552D and 552P Red wires in the W9 eHydro™ wiring harness, X28 connector, and the 552A and 552C Red wires in the W12 cruise control wiring harness.

When the load match switch is in the on position, power is supplied from the 552E Red wire, across the load match switch to the 268 Gry wire to the drive controller. This enables the load match function to prevent the engine stalling during heavy load applications.

Function, Motion Match:

To allow the operator to change how quickly the drive pedal responds to being pressed or released.

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Operating Conditions, Motion Match:

- Key switch in run position
- Engine running
- Operator on seat
- Park brake unlocked
- Motion match switch in the on position
- Machine being driven either forward or reverse

Theory of Operation, Motion Match:

Motion Match enables the operator to adjust machine acceleration and deceleration rates.

The rate of acceleration and deceleration is controlled by the drive controller to smoothly ramp the speed up and down. Two different settings provide for either quicker or slower acceleration or deceleration. This operation is controlled by the operator placing the motion match switch in either the on or off position. The change in this setting will take effect as soon as the switch is changed.

Placing the motion match switch in the on position will give the transmission higher response sensitivity to drive pedal movement. Shorter starting and stopping distances can be set for applications requiring rapid changes in direction, such as operating with a loader.

Placing the motion match switch in the off position will give the drive pedals the sensitivity that is typical to most normal operating conditions. Longer starting and stopping distances can be set to avoid turf damage in other applications.

Current is supplied to the A2 electronic drive controller (drive controller) from the switched power circuit. With the key switch in the run position, current is supplied to the 212A Red wire, F11 fuse, 552 series Red wires, X4 connector of the W9 wiring harness to the 552 series Red wires and the X26 connector and the drive controller. This circuit powers the drive controller to allow for drive control operation.

The motion match switch receives secondary switched power from the drive controller on 673A and 673 Org wires.

When the motion match switch is in the on position, power is supplied from the 673 Org wire, across the motion match switch to the 269 series Wht wires to the drive controller. This enables the motion match function for quicker acceleration and deceleration rates.

KN52281,1004477 -19-02NOV12-1/1

eHydro™/Auto HST—Motion Match and Load Match Circuit Operation—MY13

Function, Load Match (eHydro™ only)

To prevent the engine from stalling during heavy loading situations.

Operating Conditions, Load Match (eHydro™ only)

- Key switch in run position
- Engine running
- Operator on seat
- Park brake unlocked
- Load match switch in the on position
- Machine being driven either forward or reverse

Theory of Operation, Load Match (eHydro™ only)

Load match is used to eliminate operators stalling the engine during a typical application such as loader work. A throttle position sensor is installed to read the no-load engine rpm set point.

If the engine rpm drops far enough below the set point value, the current sent to the transmission drive valve coils is reduced to allow the engine to recover. The greater the load on the engine, the greater the reduction in current.

If cruise control is active and the load match comes on, the cruise speed output is held at whatever speed it is currently operating at until load match goes back to 100%.

The load match switch can be turned on or off to allow the operator to disable the load match function if desired.

The load match feature will have no effect if the machine is not being driven when the stalling load is being placed on the engine.

Switched power is provided to the load match switch from the key switch, 212A Red, F11 fuse, 552 series Red wires in the W1 main wiring harness, X4 connector, 552D and 552P Red wires in the W9 eHydro™ wiring harness, X28 connector, and the 552A and 552C Red wires in the W12 cruise control wiring harness.

When the load match switch is in the on position, power is supplied from the 552E Red wire, across the load match switch to the 268 Gry wire to the drive controller. This enables the load match function to prevent the engine stalling during heavy load applications.

Function, Motion Match

To allow the operator to change how quickly the drive pedal responds to being pressed or released.

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Operating Conditions, Motion Match

- Key switch in run position
- Engine running
- Operator on seat
- Park brake unlocked
- Motion match switch in the on position
- Machine being driven either forward or reverse

Theory of Operation, Motion Match

Motion Match enables the operator to adjust machine acceleration and deceleration rates.

The rate of acceleration and deceleration is controlled by the drive controller to smoothly ramp the speed up and down. Two different settings provide for either quicker or slower acceleration or deceleration. This operation is controlled by the operator placing the motion match switch in either the on or off position. The change in this setting will take effect as soon as the switch is changed.

Placing the motion match switch in the on position will give the transmission higher response sensitivity to drive pedal movement. Shorter starting and stopping distances can be set for applications requiring rapid changes in direction, such as operating with a loader.

Placing the motion match switch in the off position will give the drive pedals the sensitivity that is typical to most normal operating conditions. Longer starting and stopping distances can be set to avoid turf damage in other applications.

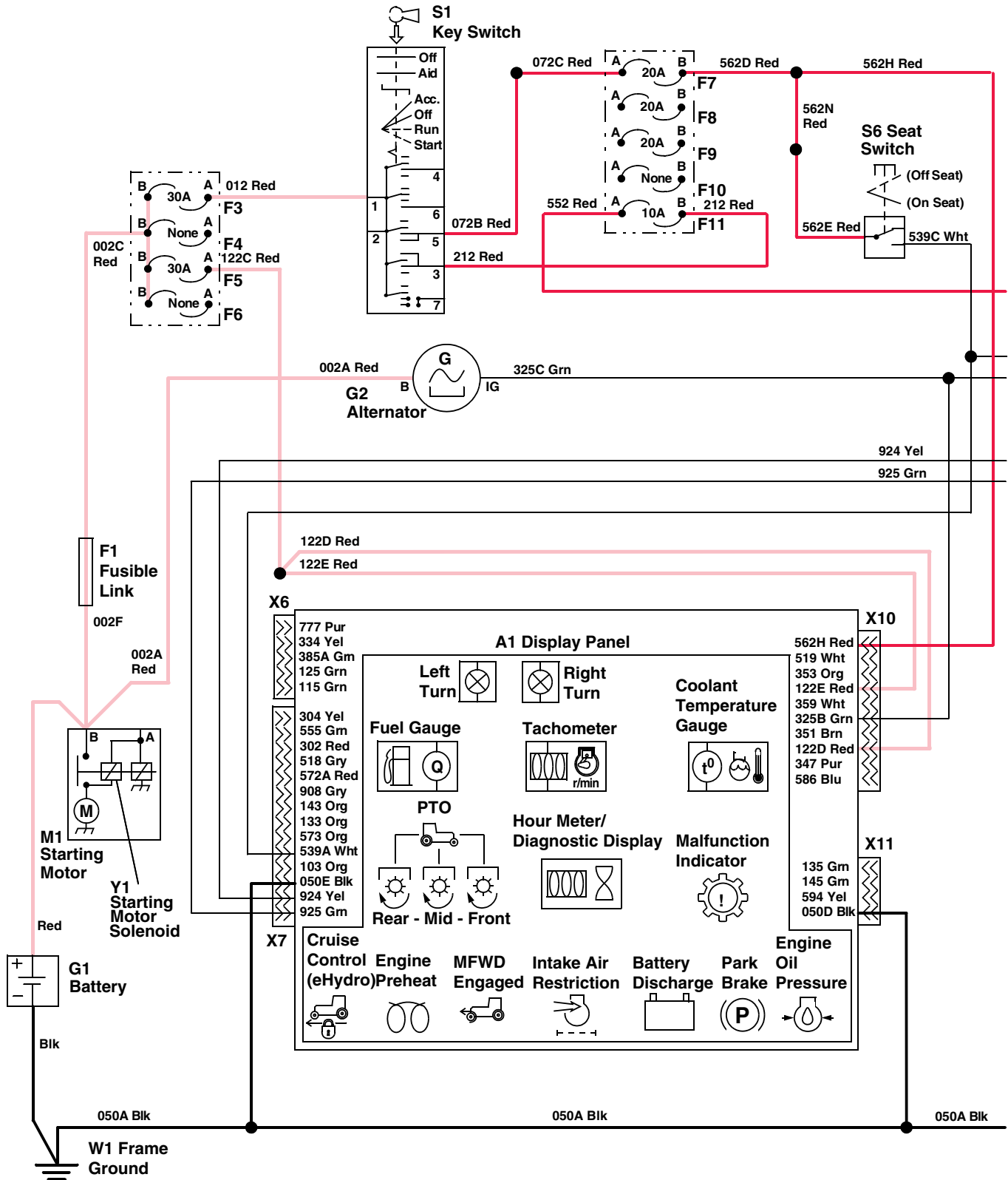
Current is supplied to the A2 electronic drive controller (drive controller) from the switched power circuit. With the key switch in the run position, current is supplied to the 212A Red wire, F11 fuse, 552 series Red wires, X4 connector of the W9 wiring harness to the 552 series Red wires and the X26 connector and the drive controller. This circuit powers the drive controller to allow for drive control operation.

The motion match switch receives secondary switched power from the drive controller on 673A and 673 Org wires.

When the motion match switch is in the on position, power is supplied from the 673 Org wire, across the motion match switch to the 269 series Wht wires to the drive controller. This enables the motion match function for quicker acceleration and deceleration rates.

KN52281,1004478 -19-21JAN13-1/1

eHydro™—Load Match and Motion Match Circuit Electrical Schematic—Pre MY08



LVAL11696 —UN—02NOV10

Continued on next page

KN52281,1004479 -19-02NOV12-1/4

A1—Display Panel
F1— Fusible Link
F3— Fuse 30A
F4— Not Used
F5— Fuse 30A
F6— Not Used
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A

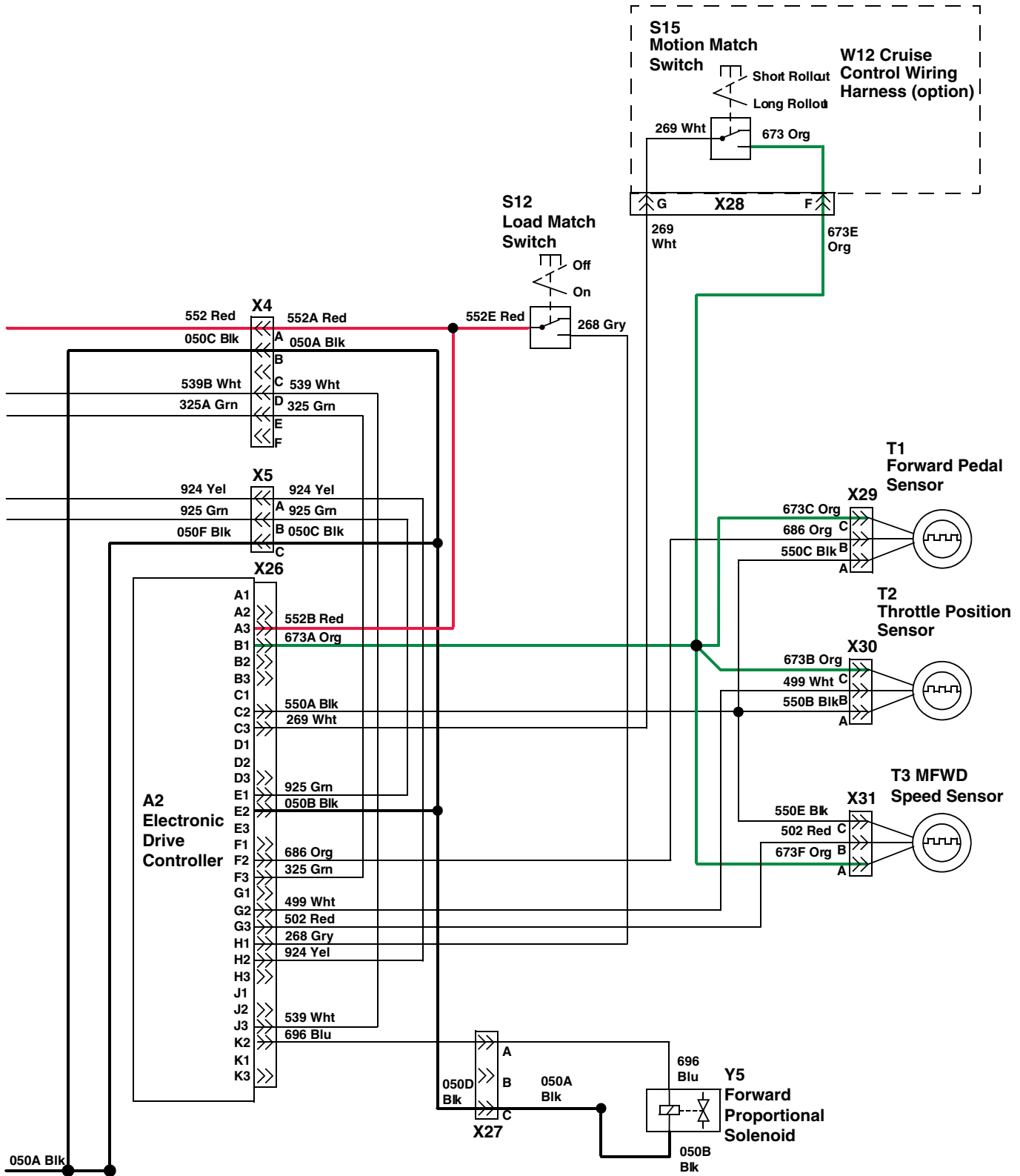
F10— Not Used
F11— Fuse 10A
G1—Battery
G2—Alternator
M1—Starting Motor
S1— Key Switch
S6— Seat Switch
W1—Frame Ground

X6— W1 Main Wiring
Harness-to-A1 Display Panel
X7— W1 Main Wiring
Harness-to-A1 Display Panel
X10— W1 Main Wiring
Harness-to-A1 Display
Panel

X11— W1 Main Wiring
Harness-to-A1 Display
Panel
Y1— Starting Motor Solenoid

Continued on next page

KN52281,1004479 -19-02NOV12-2/4



LVAL11697 —UN—02NOV10

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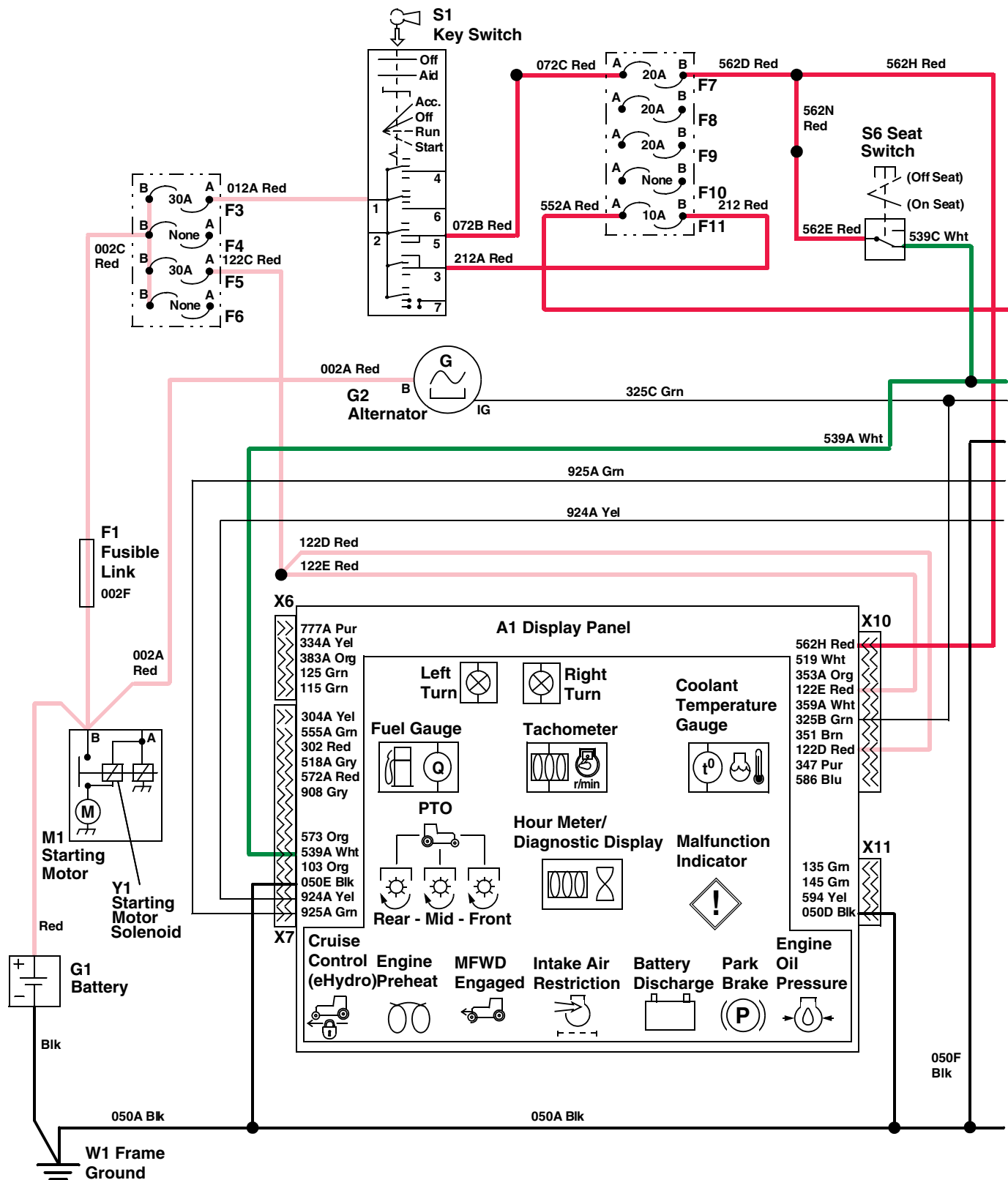
KN52281,1004479 -19-02NOV12-3/4

A2—Electronic Drive Controller	X4—W1 Main Wiring Harness-to-W9 eHydro™ Wiring Harness	X27— W9 eHydro™ Wiring Harness-to-W10 Proportional Valve Wiring Harness	X30— W9 eHydro™ Wiring Harness-to-T2 Throttle Position Sensor
S12— Load Match Switch	X5—W1 Main Wiring Harness-to-W9 eHydro™ Wiring Harness	X28— W9 eHydro™ Wiring Harness to W12 Cruise Control Wiring Harness (optional)	X31— W9 eHydro™ Wiring Harness-to-T3 MFWD Speed Sensor X32 - W9
S15— Motion Match Switch (optional)	X26— W9 eHydro™ Wiring Harness-to-A2 Electronic Drive Controller	X29— W9 eHydro™ Wiring Harness-to-T1 Forward Pedal Sensor	Y5— Forward Proportional Solenoid
T1— Forward Pedal Sensor			
T2— Throttle Position Sensor			
T3— MFWD Speed Sensor			
W12—Cruise Control Wiring Harness (optional)			

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KN52281,1004479 -19-02NOV12-4/4

eHydro™/Auto HST—Motion Match and Load Match Circuit Electrical Schematic—MY08



LVAL11698 —UN—02NOV10

Continued on next page

KN52281,100447A -19-02NOV12-1/6

A1—Display Panel
 F1— Fusible Link
 F3— Fuse 30A
 F4— Not Used
 F5— Fuse 30A
 F6— Not Used
 F7— Fuse 20A
 F8— Fuse 20A
 F9— Fuse 20A

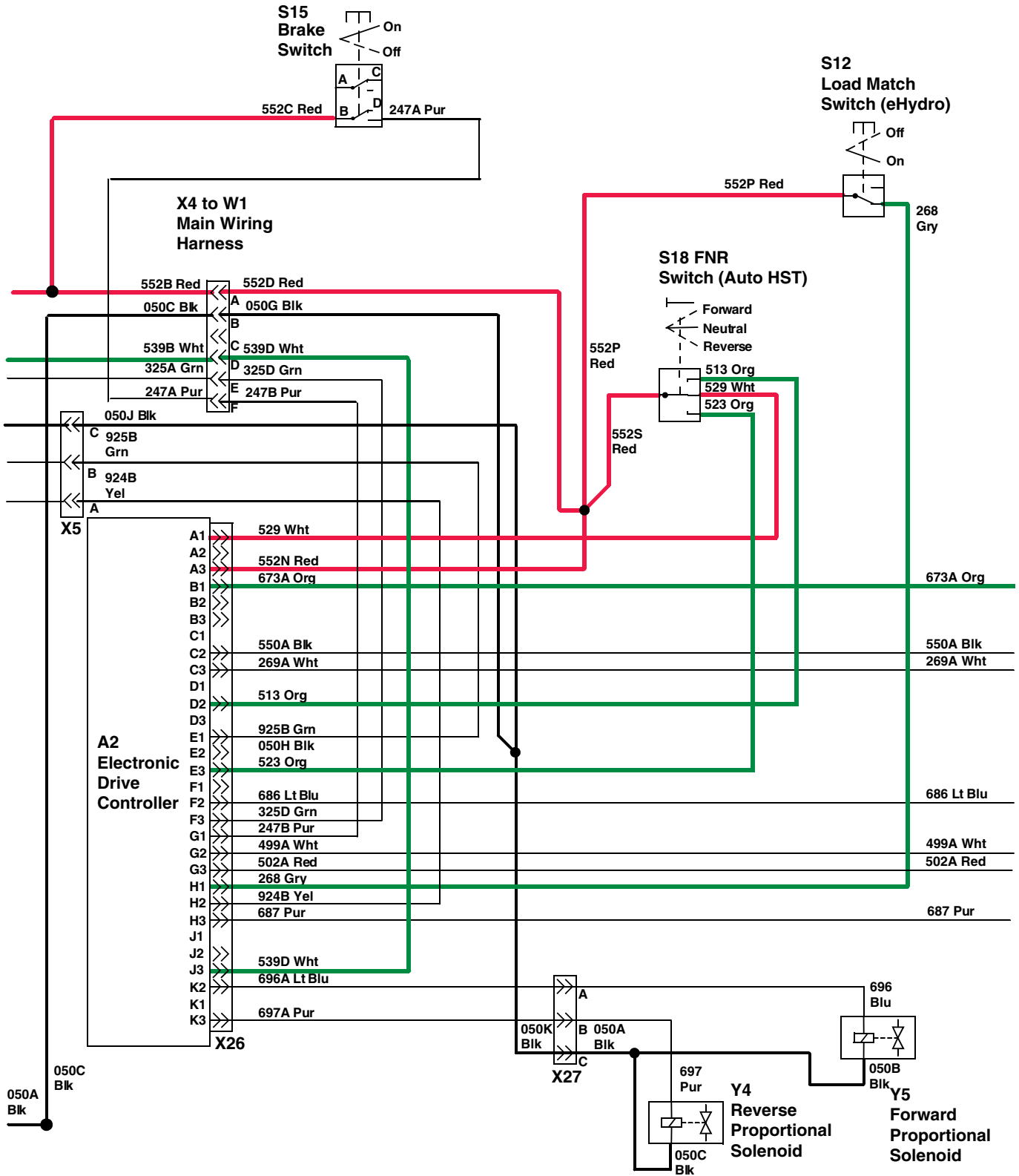
F10— Not Used
 F11— Fuse 10A
 G1—Battery
 G2—Alternator
 M1—Starting Motor
 S1— Key Switch
 S6— Seat Switch
 W1—Frame Ground

X6— W1 Main Wiring
 Harness-to-A1 Display Panel
 X7— W1 Main Wiring
 Harness-to-A1 Display Panel
 X10— W1 Main Wiring
 Harness-to-A1 Display
 Panel

X11— W1 Main Wiring
 Harness-to-A1 Display
 Panel
 Y1— Starting Motor Solenoid

Continued on next page

KN52281,100447A -19-02NOV12-2/6



LVAL11699—UN—02NOV10

Continued on next page

KN52281,100447A -19-02NOV12-3/6

**S12— Load Match Switch
eHydro™**
S15— Brake Switch
S18— FNR Switch (Auto HST)

**X4— W1 Main Wiring
Harness-to-W9 eHydro™
Wiring Harness**
**X5— W1 Main Wiring
Harness-to-W9 eHydro™
Wiring Harness**

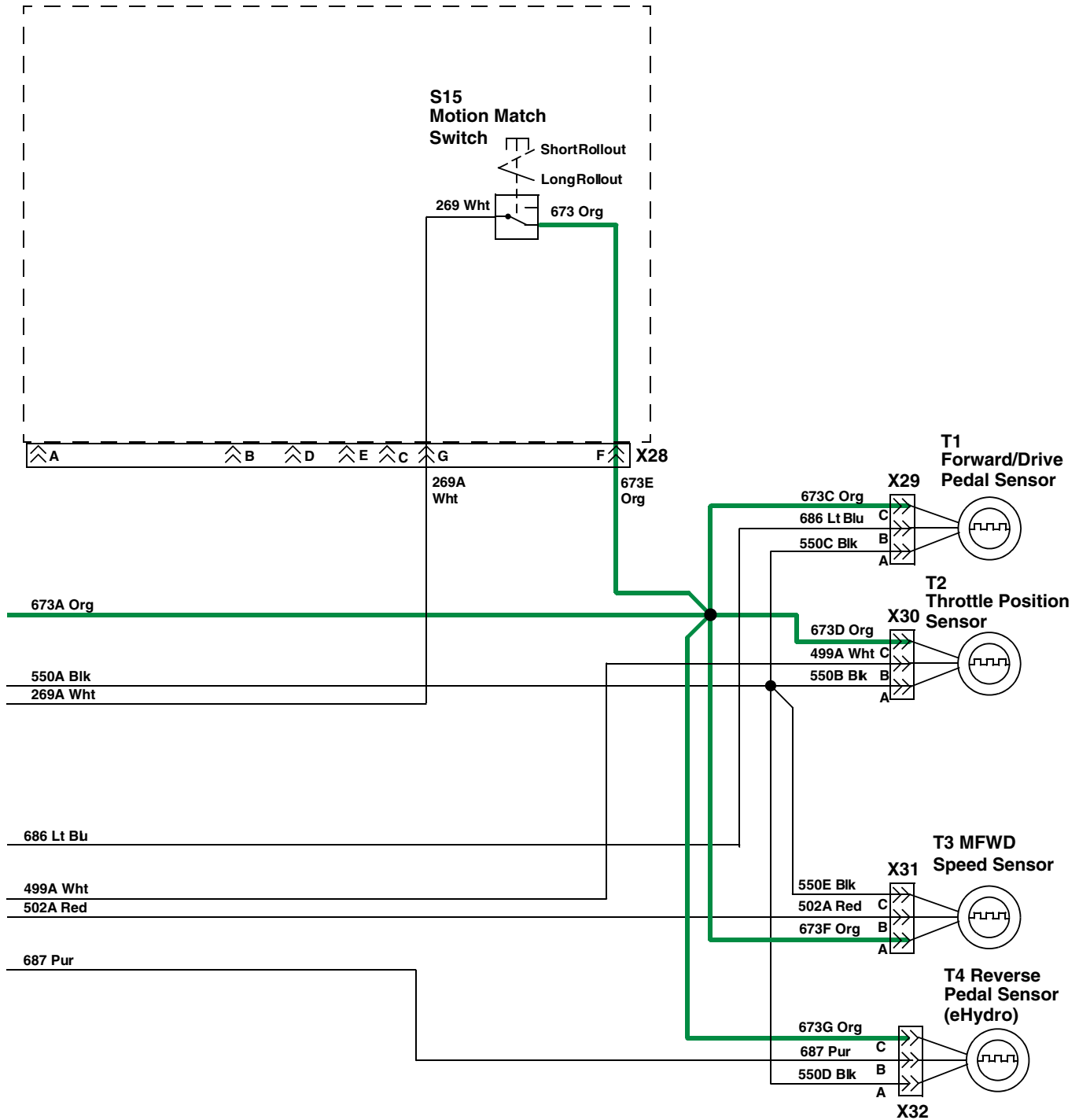
**X26— W9 eHydro™ Wiring
Harness-to-A2 Electronic
Drive Controller**
**X27— W9 eHydro™ Wiring
Harness-to-W10
Proportional Valve Wiring
Harness**

**Y4— Reverse Proportional
Solenoid**
**Y5— Forward Proportional
Solenoid**

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KN52281,100447A -19-02NOV12-4/6



LVAL11700 —UN—02NOV10

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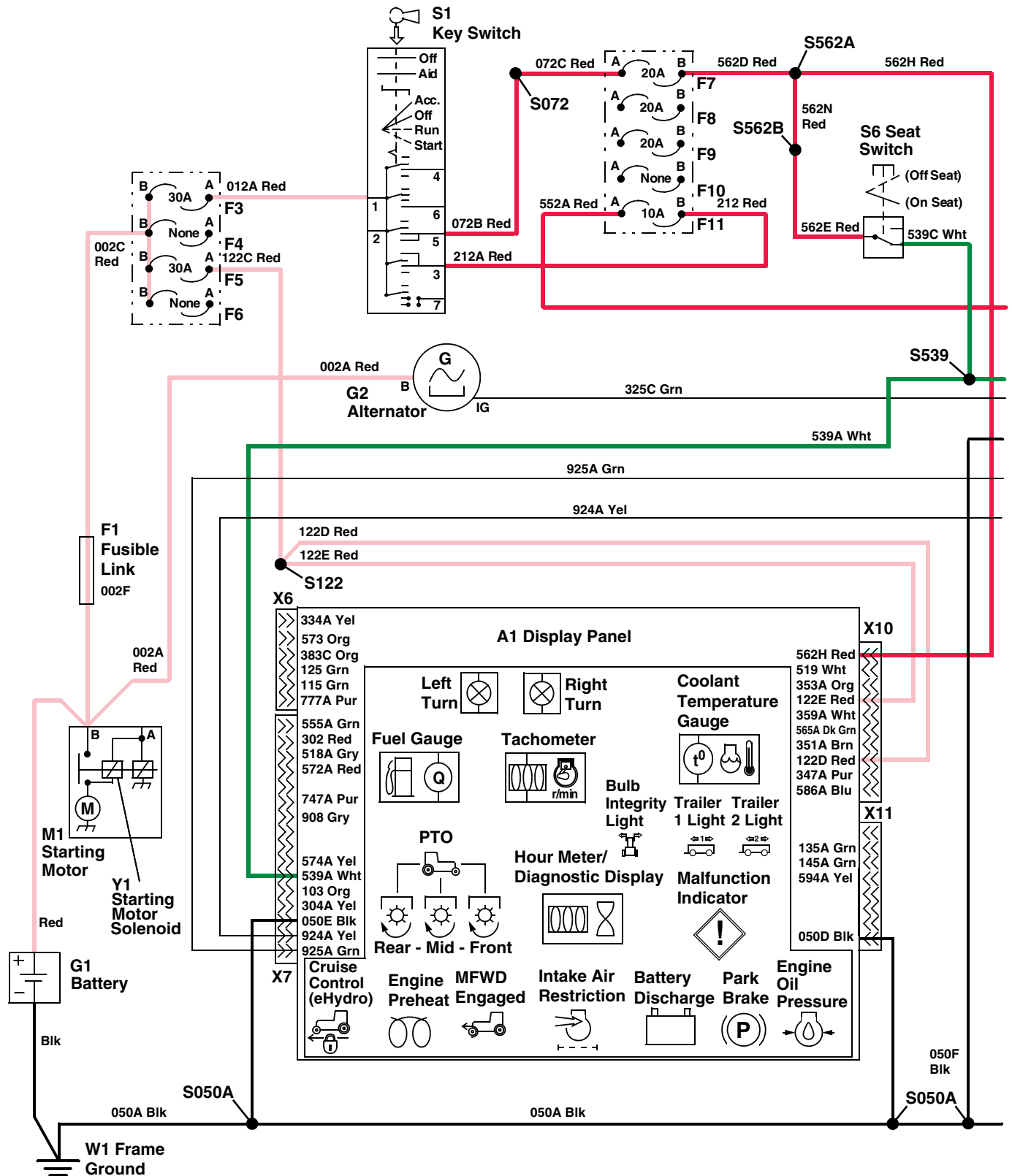
KN52281,100447A -19-02NOV12-5/6

S15— Motion Match Switch (optional)	X28— W9 eHydro™ Wiring Harness-to-W12 Cruise Control Wiring Harness (optional)	X30— W9 eHydro™ Wiring Harness-to-T2 Throttle Position Sensor
T1— Forward/Drive Pedal Sensor		X31— W9 eHydro™ Wiring Harness-to-T3 MFWD Speed Sensor
T2— Throttle Position Sensor	X29— W9 eHydro™ Wiring Harness-to-T1 Forward/Drive Pedal Sensor	X32— W9 eHydro™ Wiring Harness-to-T4 Reverse Pedal Sensor (sensor installed on eHydro™)
T3— MFWD Speed Sensor		
T4— Reverse Pedal Sensor (eHydro™)		

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KN52281,100447A -19-02NOV12-6/6

eHydro™/Auto HST—Motion Match and Load Match Circuit Electrical Schematic—MY13



Continued on next page

KN52281,100447B -19-30NOV12-1/6

A1—Display Panel
 F1— Fusible Link
 F3— Fuse 30A
 F4— Not Used
 F5— Fuse 30A
 F6— Not Used
 F7— Fuse 20A
 F8— Fuse 20A
 F9— Fuse 20A

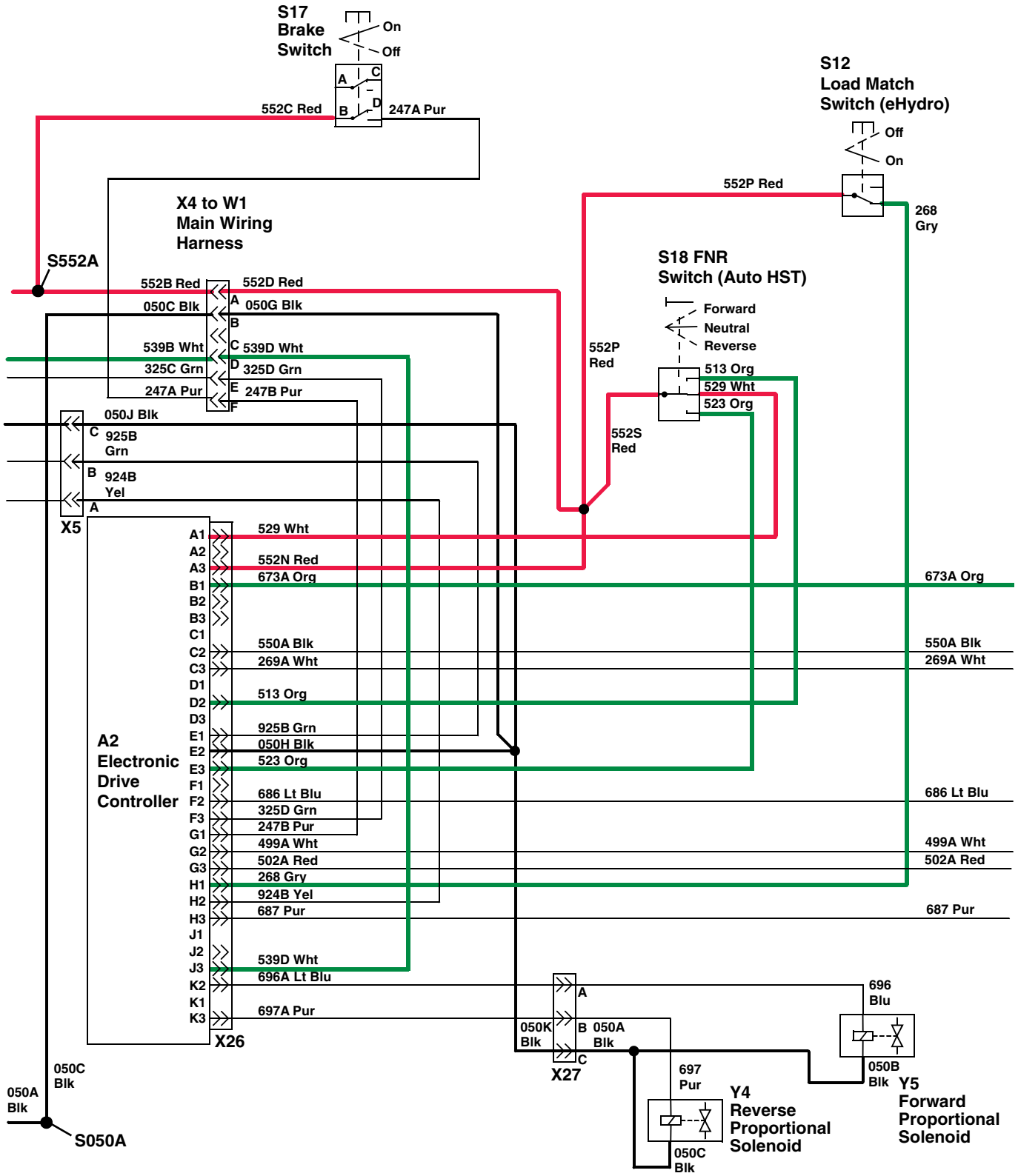
F10— Not Used
 F11— Fuse 10A
 G1—Battery
 G2—Alternator
 M1—Starting Motor
 S1— Key Switch
 S6— Seat Switch
 W1—Frame Ground

X6— W1 Main Wiring
 Harness-to-A1 Display Panel
 X7— W1 Main Wiring
 Harness-to-A1 Display Panel
 X10— W1 Main Wiring
 Harness-to-A1 Display
 Panel

X11— W1 Main Wiring
 Harness-to-A1 Display
 Panel
 Y1— Starting Motor Solenoid

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KN52281,100447B -19-30NOV12-2/6



LVAL38742—UN—09JAN13

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KN52281,100447B -19-30NOV12-3/6

S12— Load Match Switch
eHydro™
S15— Brake Switch
S18— FNR Switch (Auto HST)

X4— W1 Main Wiring
Harness-to-W9 eHydro™
Wiring Harness
X5— W1 Main Wiring
Harness-to-W9 eHydro™
Wiring Harness

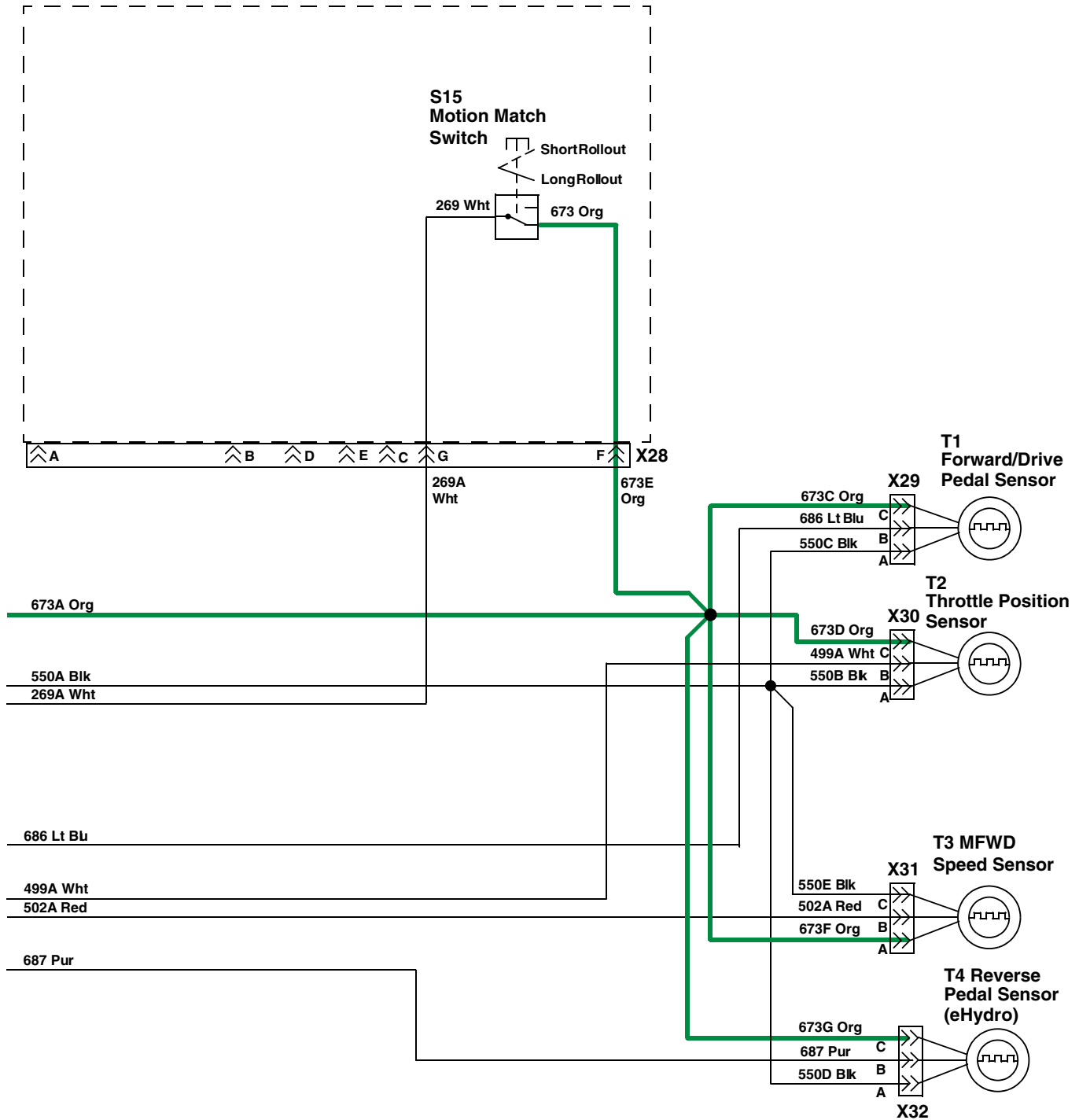
X26— W9 eHydro™ Wiring
Harness-to-A2 Electronic
Drive Controller
X27— W9 eHydro™ Wiring
Harness-to-W10
Proportional Valve Wiring
Harness

Y4— Reverse Proportional
Solenoid
Y5— Forward Proportional
Solenoid

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KN52281,100447B -19-30NOV12-4/6



LVAL11700 —UN—02NOV10

Continued on next page

KN52281,100447B -19-30NOV12-5/6

S15— Motion Match Switch (optional)	X28— W9 eHydro™ Wiring Harness-to-W12 Cruise Control Wiring Harness (optional)	X30— W9 eHydro™ Wiring Harness-to-T2 Throttle Position Sensor
T1— Forward/Drive Pedal Sensor		X31— W9 eHydro™ Wiring Harness-to-T3 MFWD Speed Sensor
T2— Throttle Position Sensor	X29— W9 eHydro™ Wiring Harness-to-T1 Forward/Drive Pedal Sensor	X32— W9 eHydro™ Wiring Harness-to-T4 Reverse Pedal Sensor (sensor installed on eHydro™)
T3— MFWD Speed Sensor		
T4— Reverse Pedal Sensor (eHydro™)		

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KN52281,100447B -19-30NOV12-6/6

eHydro™—Load Match and Motion Match Control Circuit Diagnosis

Test Procedure A—Load Match:

Verify that the load match switch has been configured and edited into the display panel memory. (See [Configure the Display](#) in Section 40, Group 45.), and (see [Editing Load Match Settings—eHydro™](#) in Section 40, Group 45.)

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on eHydro™

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models. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.) and see Diagnostic Mode 2 (eHydro™/Auto HST).

Test Conditions:

- Key switch in run position, engine not running.
- Operator on seat.
- Park brake locked.
- Load match switch moved from off to on.
- Motion match switch off.

KN52281,100447C -19-02NOV12-1/12

Load Match Circuit

KN52281,100447C -19-02NOV12-2/12

Step 1

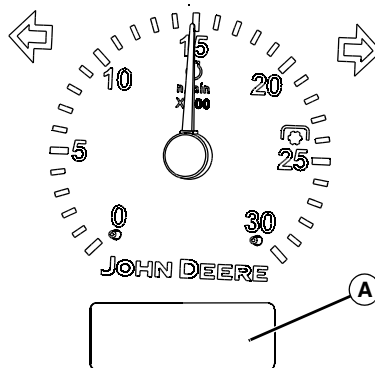
Do any fault codes appear in the LCD display?

YES: Correct the possible faults. (See [Display Panel Fault Codes—Auto HST/eHydro™](#) in Section 40, Group 45.)

NO: Go to next step.

KN52281,100447C -19-02NOV12-3/12

Step 2



LVAL11701—UN—02NOV10
A—LCD Display

Press and release the display mode switch until the words “LoAdOF” appear in the LCD display (A). Place the load match switch in the on position. Does the display change to “LoAdOn”?

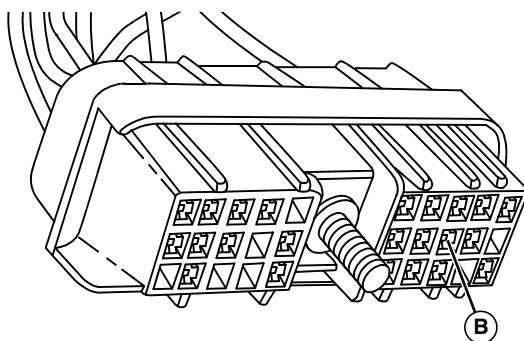
YES: Circuit is functional.

NO: Go to next step.

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KN52281,100447C -19-02NOV12-4/12

Step 3



LVAL11702 —UN—02NOV10

B—X26 Drive Controller Connector Terminal H1, 268 Gry Wire

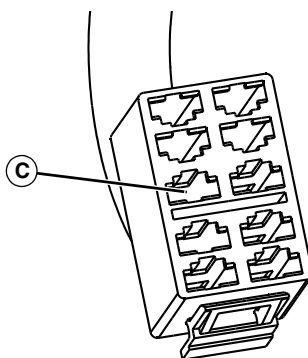
Disconnect the X26 connector to the drive controller. Is battery voltage present at terminal H1, 268 Gry wire (B)?

YES: If the display panel does not display “LoAdOn”, check the 924 Yel and 925 Grn wires and connections. If ok, replace the drive controller.

NO: Test the load match switch. (See [Load Match Switch Test—eHydro™](#) in Section 40, Group 40.) Check the 268 Gry wire and connections. Go to next step.

KN52281,100447C -19-02NOV12-5/12

Step 4



LVAL11703 —UN—02NOV10

C—Load Match Switch, 552 Red Wire

Disconnect the load match switch. Is battery voltage present at the load match switch, 552 Red wire (C)?

YES: Test complete.

NO: Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

KN52281,100447C -19-02NOV12-6/12

Test Procedure B—Motion Match:

Verify that the motion match switch has been configured and edited into the display panel memory. (See [Configure the Display](#) in Section 40, Group 45.), and (see [Editing Motion Match Settings—eHydro™/Auto HST](#) in Section 40, Group 45.)

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on eHydro™ models. (See [Entering Diagnostic and Calibration Modes](#)

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in Section 40, Group 45.) and see Diagnostic Mode 2 (eHydro™/Auto HST).

Test Conditions:

- Key switch in run position, engine not running.
- Operator on seat.
- Park brake locked.
- Load match switch off.
- Motion match switch moved from off to on.

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KN52281,100447C -19-02NOV12-7/12

Motion Match Circuit

KN52281,100447C -19-02NOV12-8/12

Step 1

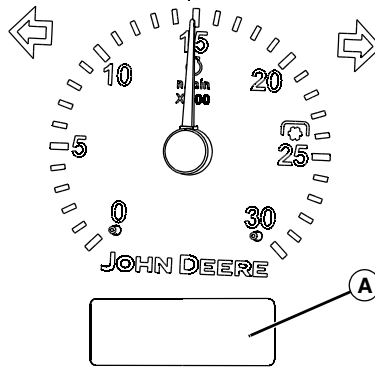
Do any fault codes appear in the LCD display?

YES: Correct the possible faults. (See [Display Panel Fault Codes—Auto HST/eHydro™](#) in Section 40, Group 45.)

NO: Go to next step.

KN52281,100447C -19-02NOV12-9/12

Step 2



LVAL11704 —UN—02NOV10

A—LCD Display

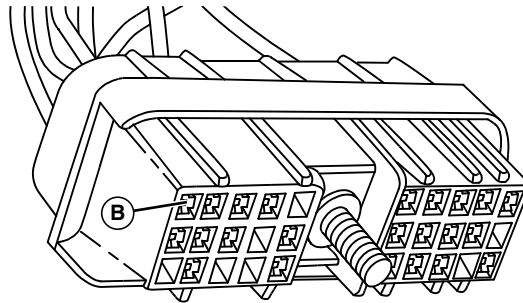
Press and release the display mode switch until the words “MotnOF” appear in the LCD display (A). Place the load match switch in the on position. Does the display change to “MotnOn”?

YES: Circuit is functional.

NO: Go to next step.

KN52281,100447C -19-02NOV12-10/12

Step 3



LVAL11705 —UN—02NOV10

B—X26 Drive Controller Connector Terminal A3, 552N Red Wire

Disconnect the X26 connector to the drive controller. Is battery voltage present at terminals A3, 552N Red wire (B)?

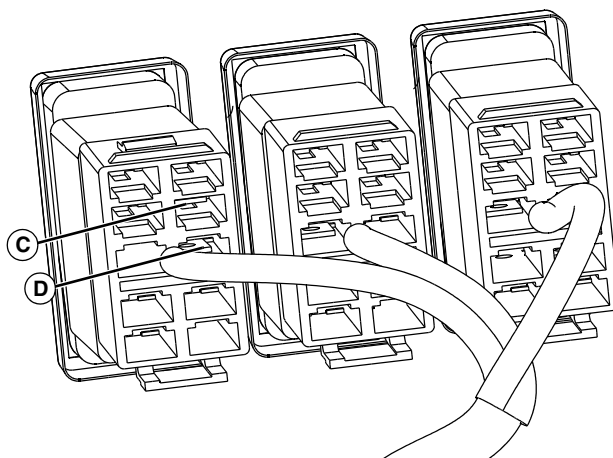
YES: Go to next step.

NO: Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

Continued on next page

KN52281,100447C -19-02NOV12-11/12

Step 4



LVAL11706 —UN—02NOV10

C—Motion Match Switch, 269 Wht Wire

D—Motion Match Switch, 673 Org Wire

With motion match switch in the on position. Is battery voltage present at the 269 Wht (C) and 673 Org (D) wires?

YES: Check the 269 Wht wire and connections. If ok, replace drive controller.

NO: 269 Wht wire. Test the motion match switch. (See [Motion Match Switch Test—eHydro™/Auto HST](#) in Section 40, Group 40.) Check the 673, 673E, and 673A Org wires and connections.

NO: 673 Org wire. Check the 673, 673E, and 673A Org wires and connections. If ok, replace drive controller.

KN52281,100447C -19-02NOV12-12/12

Auto HST—Motion Match Control Circuit Diagnosis

Test Procedure A—Motion Match:

Verify that the motion match switch has been configured and edited into the display panel memory. (See [Configure the Display](#) in Section 40, Group 45.), and (see [Editing Motion Match Settings—eHydro™/Auto HST](#) in Section 40, Group 45.)

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on Auto HST

models. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.) and see Diagnostic Mode 2 (eHydro™/Auto HST).

Test Conditions:

- Key switch in run position, engine not running.
- Operator on seat.
- Park brake locked.
- Motion match switch moved from off to on.

KN52281,100447D -19-02NOV12-1/6

Motion Match Circuit

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KN52281,100447D -19-02NOV12-2/6

Step 1

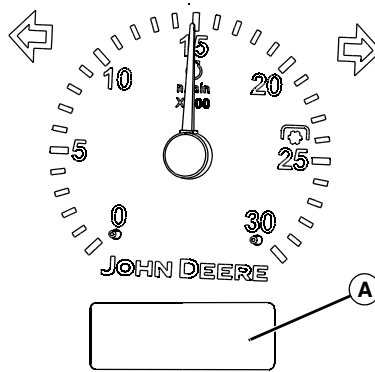
Do any fault codes appear in the LCD display?

YES: Correct the possible faults. (See [Display Panel Fault Codes—Auto HST/eHydro™](#) in Section 40, Group 45.)

NO: Go to next step.

KN52281,100447D -19-02NOV12-3/6

Step 2



LVAL11707 —UN—02NOV10
A—LCD Display

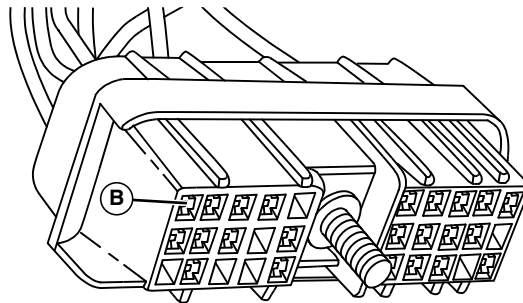
Press and release the display mode switch until the words “MotnOF” appear in the LCD display (A). Place the load match switch in the on position. Does the display change to “MotnOn”?

YES: Circuit is functional.

NO: Go to next step.

KN52281,100447D -19-02NOV12-4/6

Step 3



LVAL11708 —UN—02NOV10

B—X26 Drive Controller Connector Terminal A3, 552N Red Wire

Disconnect the X26 connector to the drive controller. Is battery voltage present at terminals A3, 552N Red wire (B)?

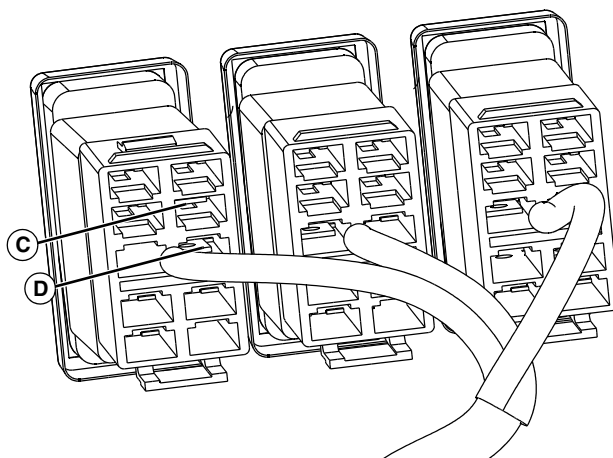
YES: Go to next step.

NO: Check the 552 Red series wires and connections. Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 40, Group 35.)

Continued on next page

KN52281,100447D -19-02NOV12-5/6

Step 4



LVAL11709, —UN—02NOV10

C—Motion Match Switch, 269A Wht Wire

D—Motion Match Switch, 673 Org Wire

With motion match switch in the on position, is battery voltage present at the 269A Wht (C) and 673 Org (D) wires?

YES: Check the 269A Wht wire and connections. If OK, replace drive controller.

NO: 269 Wht wire. Test the motion match switch. (See [Motion Match Switch Test—eHydro™/Auto HST](#) in Section 40, Group 40.) Check the 673, 673E, and 673A Org wires and connections.

NO: 673 Org wire. Check the 673, 673E, and 673A Org wires and connections. If OK, replace drive controller.

KN52281,100447D -19-02NOV12-6/6

Ground Circuit Test

Reason

To check for opens, loose terminal wire crimps, poor connections, or corrosion in the ground circuit. The voltmeter method checks ground connections under load.

Equipment

- Ohmmeter or Voltmeter

Ohmmeter Procedure

1. Turn key switch to off position. Engage park brake.
2. Connect ohmmeter negative (black) lead to negative (-) terminal of battery. Put meter positive (red) lead on negative terminal of battery and record reading. Reading should be 0.1 ohm or less.
3. Put meter red lead on ground terminal of circuit or component to be tested that is closest to the battery negative terminal. Resistance reading must be very close to or the same as the battery negative terminal reading. Work backwards from the battery on the ground side of the problem circuit until the resistance reading increases above 0.1 ohms. The problem is between the last two test points. If a problem is indicated, disconnect the wiring harness connector to isolate the wire or component and check resistance

again. Maximum allowable resistance is 0.1 ohms. Check connectors closely as disconnecting and connecting may temporarily solve problem.

Voltmeter Procedure

1. Put transmission in neutral. Lock park brake. Put PTO switch in off position. Turn key switch to on position.
2. Connect voltmeter negative (black) lead to negative (-) terminal of battery.
3. Put meter positive (red) lead on ground terminal of component to be tested. Be sure the component circuit is activated (key switch on, switches closed) so voltage will be present at the component. Record voltage. Voltage must be greater than 0 but less than 1 volt. Some components will have a very small voltage reading on the ground side and still be operating correctly.

Results

- If resistance is above 0.1 ohms, check for open wiring, loose terminal wire crimps, poor connections, or corrosion in the ground circuit.
- If voltage is 0, the component is open.
- If voltage is greater than 1 volt, the ground circuit is bad. Check for open wiring, loose terminal wire crimps, poor connections, or corrosion in the ground circuit.

KN52281,100447E -19-16JAN13-1/1

Battery Voltage and Specific Gravity Test

Reason

To check voltage and determine condition of battery.

Equipment

- Voltmeter or JTO5685 Battery Tester
- Hydrometer

Procedure

CAUTION: Avoid Injury!

Sulfuric acid in battery electrolyte is poisonous. It is strong enough to burn skin, eat holes in clothing, and cause blindness if splashed into the eyes.

Avoid the hazard by:

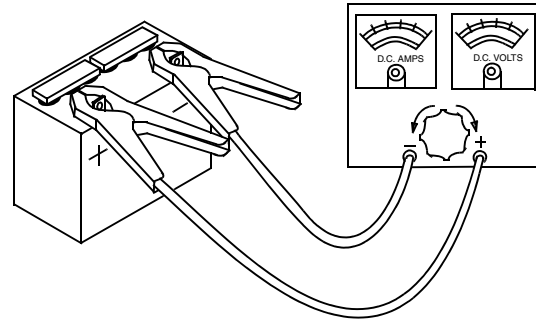
Filling batteries in a well-ventilated area. Wearing eye protection and rubber gloves. Avoiding breathing fumes when electrolyte is added. Avoid spilling or dripping electrolyte. Use proper jump-start procedure.

If you spill acid on yourself:

Flush your skin with water. Apply baking soda or lime to help neutralize the acid. Flush your eyes with water for 10—15 minutes. Get medical attention immediately

If acid is swallowed:

Drink large amounts of water or milk. Then drink milk of magnesia, beaten eggs, or vegetable oil. Get medical attention immediately.



Battery Voltage Check

LVAL11710—UN—02NOV10

1. Park machine safely with park brake locked.
2. Raise hood and secure with prop rod.
3. Inspect battery terminals and case for breakage or cracks.
4. Clean battery terminals and top of battery.
5. Check electrolyte level in each battery cell. Add clean, soft water as needed. If water is added, charge battery for 20 minutes at 10 amps.
6. Remove surface charge by placing a small load on the battery for 15 seconds.
7. Check battery voltage with voltmeter or JTO5685 Battery Tester.

Continued on next page

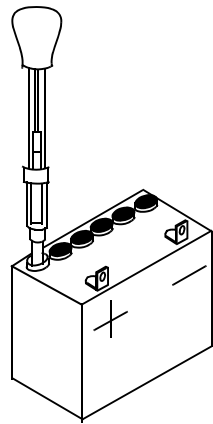
KN52281, 100447F -19-16JAN13-1/2

- 8. Use an hydrometer to check for a minimum specific gravity of 1.265 with less than 50 point variation in each cell at full charge at 26.7°C (80°F).
- 9. If using an electronic battery tester, follow user instructions.

Results

- Battery voltage less than specification, charge battery.
- Battery voltage more than specification, test specific gravity.
- All cells less than 1.175, charge battery at 10 amp rate, 15V for 6—12 hours.
- All cells less than 1.225 with less than 50 point variation, charge battery at 10 amp rate, 15V for 3—6 hours.
- All cells more than 1.265 with less than 50 point variation, load test battery.
- More than 50 point variation: replace battery.

	Specification
Battery—Voltage	
(minimum).....	12.4 V



Battery Specific Gravity Check

Battery—Specific Gravity	
(minimum).....	1.265 with less than
	50 point variation between cells
Battery—Temperature.....	26.7°C (80°F)

KN52281,100447F -19-16JAN13-2/2

LVAL11711 —UN—02NOV10

Battery—Charge

Reason

To increase battery charge after battery has been discharged.

Equipment

- Battery charger (variable rate)

Procedure

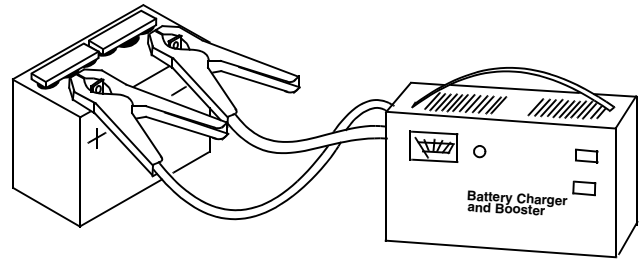
1. Connect variable rate charger to battery.

NOTE: Maximum charge time at boost setting is 10 minutes. Allow an additional 5 minutes for each 10 degrees below 70 degrees F.

2. Start charger at slow rate. Increase charge rate one setting at a time. Check charger ammeter after 1 minute at each setting. Maintain 10 amp charge rate. Use boost setting as necessary.
3. Check if battery is accepting a 10 amp charge after 10 minutes at boost setting.
 - Battery will not accept 10 amp charge after 10 minutes at boost setting: replace battery.
 - Battery is accepting 10 amp charge after 10 minutes at boost setting, and battery did not need water: go to steps 6 and 7.
 - Battery is accepting 10 amp charge after 10 minutes at boost setting, but battery did need water or all cells were below 1.175: go to steps 4 and 5.

IMPORTANT: Avoid Damage! Decrease charge rate if battery gases or bubbles excessively or becomes too warm to touch.

4. Set charger to specification.



Connect Charger To Battery

Specification

Charger—Amperage..... 15—25 A

NOTE: If battery was discharged at slow or unknown rate, charge at 10—15 amps for 6—12 hours (Maintenance-free battery: 12—24 hours). If battery was discharged at fast rate, charge at 20—25 amps for 2—4 hours (Maintenance-free battery: 4—8 hours).

5. Check specific gravity after 30 minutes (60 minutes for maintenance-free battery).
 - More than 50 point variation between cells: replace battery.
 - Less than 50 point variation between cells: go to steps 6 and 7.
6. Continue charging battery until specific gravity specification.

Specification

Battery—Specific Gravity..... 1.230—1.265 points

7. Load test battery. (See Battery—Load Test in Section 40, Group 40.)

LVAL11712 —UN—02NOV10

KN52281,1004480 -19-16JAN13-1/1

Battery—Load Test

Reason

To check condition of battery under load.

NOTE: Before applying a load to battery. (See Battery—Charge in Section 40, Group 40.)

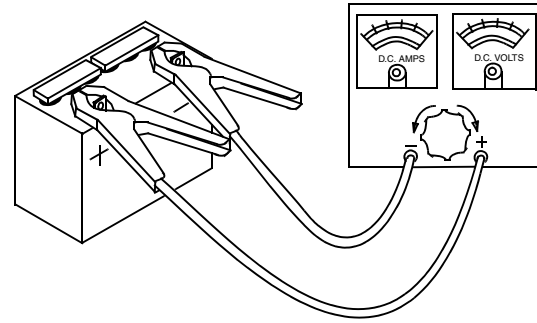
Equipment

- JTO5685 Battery Tester
- or equivalent

NOTE: Use the procedures given with the tester.

1/2 CCA Load Test Procedure

1. Turn load knob of tester clockwise until amperage reading is equal to:
 - Cold cranking amperage rating (use blue scale),
 - or,
 - 1/2 the rated CCA in amps (use black scale).
2. Hold for 15 seconds and turn load knob of tester off.



Battery Load Test

3. Read battery voltage.

Results

- If the battery does not indicate the specified volts or more, replace battery (See specification).

Specification

Battery—Voltage
(minimum).....9.6V

KN52281,1004481 -19-16JAN13-1/1

LVAL11713—UN—02NOV10

Alternator Regulated Voltage Test

Reason

To determine charging output of the alternator.

Equipment

- Voltmeter

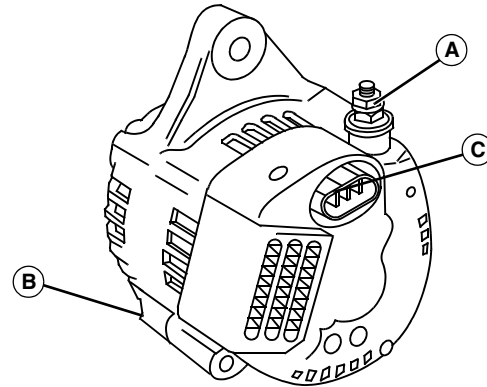
Procedure

IMPORTANT: Avoid Damage! Perform this test quickly to prevent damage to the battery. Do not apply full load to battery for more than 10 seconds.

1. Park machine safely with park brake locked.
2. Raise hood and secure with prop rod.
3. Measure and note the battery voltage across the battery terminals.
4. Measure voltage between battery lead (A) and frame ground (B). This reading should be within 0.1 volts of the battery voltage measurement.

NOTE: If connector (C) is not connected, the voltage at terminal (A) will be at battery voltage.

- If voltage reading is more than 0.2 volts different than battery voltage, check the ground connections and the battery connections for corrosion.



A—Battery Lead
B—Frame Ground

C—Connector

5. Start and run engine at high idle. Battery voltage should read to specification.

Specification

High Idle—Voltage..... 14.3—14.8 VDC

Results

If reading does not meet specifications, disassemble the alternator and test the individual components. (See Alternator Disassembly and Assembly in Section 60, Group 40.)

KN52281,1004482 -19-16JAN13-1/1

LVAL11714—UN—02NOV10

Regulated Amperage and Voltage Test

Reason

To determine the regulated (charging) output of the alternator.

NOTE: Battery must be in a good state of charge.

Equipment

- JTO5712 Current Gun
- Voltmeter
- JTO5685 Battery Tester

Procedure

1. Park machine safely with park brake locked.
2. Raise hood and secure with prop rod.

IMPORTANT: Avoid Damage! Turn load knob fully counterclockwise into off position before making any test connections.

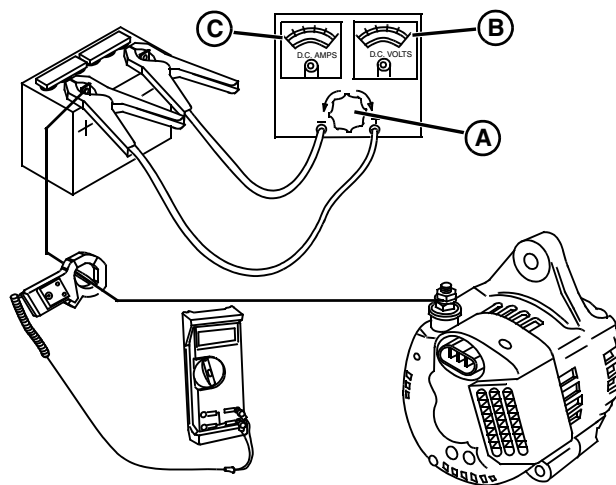
3. Connect JTO5712 Current Gun to voltmeter and put around positive (red) battery cable going to alternator. Set current gun for DC current.
4. Connect battery tester to battery.

IMPORTANT: Avoid Damage! Perform these tests quickly to prevent damage to battery tester. Do not apply full load to battery for more than 10 seconds.

5. Turn load knob (A) clockwise until voltage on voltage tester scale reads 11 volts for 5 seconds only to partially drain battery.
6. Quickly turn load knob completely counterclockwise to off position.
7. Start and run engine at high idle. Battery voltage should read within specifications.

Specification

Battery—Voltage..... 14.3—14.8 VDC
Battery—Temperature..... 25°C (77°F)



A—Load Knob
B—Tester Voltage Scale

C—Tester Amperage Scale

8. Turn load knob clockwise until voltage on tester voltage scale (B) reads 11 volts and look at current for a minimum reading of amps (see specification).

Specification

Minimum—Amperage..... 13.5 A

9. Quickly turn load knob completely counterclockwise to off position.
10. After load test, battery voltage should return to the voltage level prior to test.

Results

- If current gun amp reading is below specification, and you have verified voltage to ground to regulator/rectifier, replace regulator/rectifier.
- If at any time voltage increase exceeds specifications, replace regulator/rectifier.

Specification

Battery—Voltage..... 14.8 VDC

KN52281,1004483 -19-16JAN13-1/1

Starting Motor Solenoid Test

Reason

To determine if the starting motor is defective.

Equipment

- Jumper wire

CAUTION: Avoid Injury! This test will cause engine to turn over. Engine may start. Ensure fuel shutoff solenoid is disconnected, transmission is in neutral and PTO is off.

Procedure 1

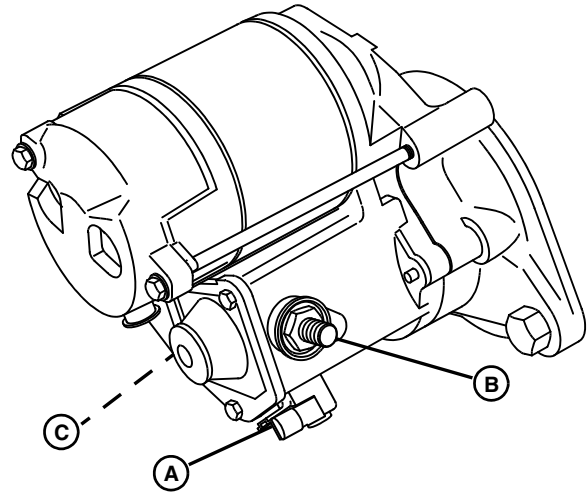
1. Park machine safely in neutral with park brake locked.
2. Raise hood and secure with prop rod.
3. Disconnect fuel shutoff solenoid wire connector.
4. Disconnect 309 Wht wire from starting motor solenoid terminal (A).
5. Connect jumper wire to positive (+) battery terminal and briefly jump to starting motor solenoid terminal (A).

Results 1

- Starting motor runs—solenoid is good, test cranking circuit wiring.
- Starting motor does not run—go to next step.

Procedure 2

Connect jumper wire between starting motor solenoid large terminals (B and C).



A—Starting Motor Solenoid Terminal
B—Starting Motor Solenoid Large Terminal

C—Starting Motor Solenoid Large Terminal

Results 2

- Starting motor runs—replace starting motor solenoid.
- Starting motor does not run—check battery cables. If ok, replace starting motor.

LVAL11716 —UN—02NOV10

KN52281,1004484 -19-16JAN13-1/1

Starting Motor Amperage Draw Test

Reason

To determine the amperage required to crank the engine and check starter motor operation under load.

Equipment

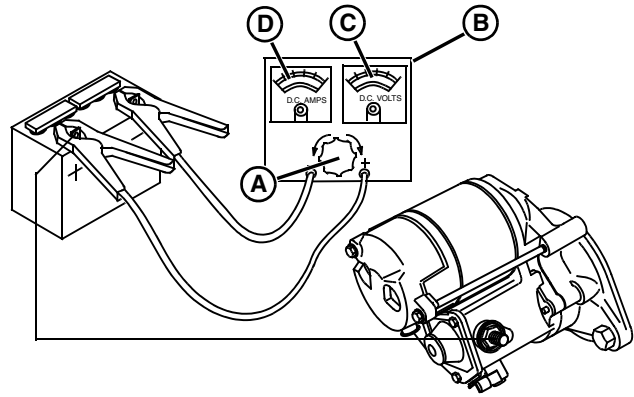
- JTO5685 Battery Tester

Procedure

1. Park machine safely in neutral with park brake locked.
2. Raise hood and secure with prop rod.
3. Disconnect fuel shutoff solenoid wire connector.

IMPORTANT: Avoid Damage! Turn load knob (A) fully counterclockwise (out) into off position before making any test connections.

4. Connect JTO5685 Battery Tester (B) to battery.
5. Crank engine and read voltage on tester voltage scale (C).
6. Turn key switch to the off position. Adjust load knob until battery voltage reads the same as when cranking.
7. Read amperage on tester amperage scale (D).
8. Turn load knob (A) fully counterclockwise.



A—Load Knob
B—JTO5685 Battery Tester

C—Tester Voltage Scale
D—Tester Amperage Scale

Results

- If amperage is greater than specifications, test starting motor No-Load RPM and Amperage to determine if the starting motor is binding or damaged.

Specification

Starting Motor
Draw—Amperage..... 150 A

- If the starting motor is good, check internal engine components for binding or damage.

KN52281,1004485 -19-16JAN13-1/1

LVAL11717 —UN—02NOV10

Starting Motor No-Load Amperage Draw and RPM Test

Reason

To determine if starter is binding or has excessive amperage draw under no-load.

Equipment

- JTO2153 Current Clamp
- JT05791 Multitester
- JTO5719 Hand-Held Digital Tachometer
- Jumper Cables
- Jumper wire

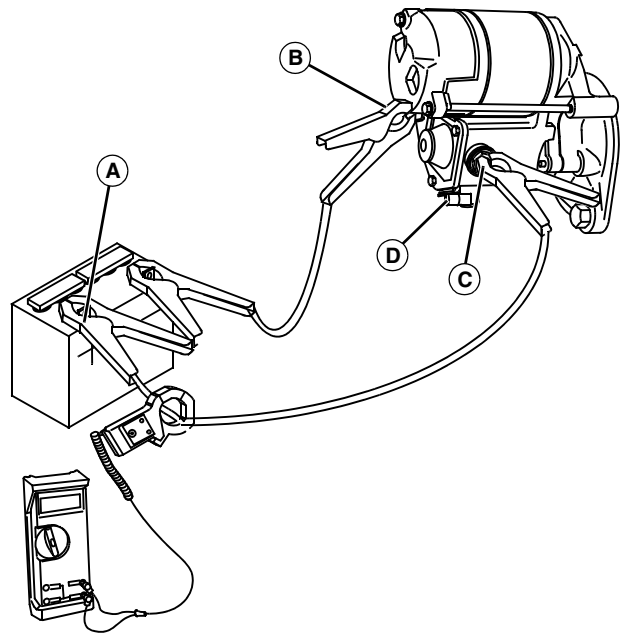
Procedure

NOTE: Check that battery is fully charged and of proper size to ensure accuracy of test.

1. Park machine safely in neutral with park brake locked.
2. Raise hood and secure with prop rod.
3. Remove starting motor assembly from machine and place starting motor in vice.
4. Connect jumper cables to a 12 volt battery.
5. Connect cable between positive (+) battery terminal (A) to starting motor solenoid (C).
6. Connect cable between negative (-) battery terminal to starting motor body (B).
7. Attach JTO2153 Current Clamp to positive (+) cable.

IMPORTANT: Avoid Damage! Perform these tests quickly to prevent damage to starting motor. Complete test in 20 seconds or less.

8. Use a jumper wire to briefly connect positive (+) starting motor solenoid terminal (D) to positive (+) battery terminal (A). Starting motor should engage and run.
9. Read and record starting motor amperage and rpm with JTO5719 Hand-Held Digital Tachometer.



A—Positive (+) Battery Terminal
B—Starting Motor Body

C—Starting Motor Solenoid Terminal
D—Starting Motor Solenoid Terminal

Results

- If solenoid “clicks” or chatters and starting motor does not turn, replace starting motor.
- If pinion gear engages and starting motor doesn’t turn, replace starting motor.
- If starting motor engages and runs, but amperage is more than specification at 4440 rpm, repair or replace starting motor.

Specification

Starting Motor @ 4440 rpm—Amperage..... 325 A

- If free-running rpm is less than 4000 rpm, repair or replace starting motor.

KN52281,1004486 -19-16JAN13-1/1

LVAL11718—UN—02NOV10

Fuse Test

Reason

To verify that fuse has continuity.

Equipment

- Ohmmeter or continuity tester

Procedure

1. Park machine safely in neutral with park brake locked.
2. Open plastic panel below steering column support.
3. Remove fuse from load center.
4. Check visually for broken fuse filament (A).
5. Connect ohmmeter or continuity tester to each end of fuse.
6. Check for continuity.



A—Broken Fuse Filament

Results

- If continuity is not indicated, replace the fuse.

KN52281,1004487 -19-16JAN13-1/1

LVAL11719—UN—02NOV10

Manifold Heater Test

Reason

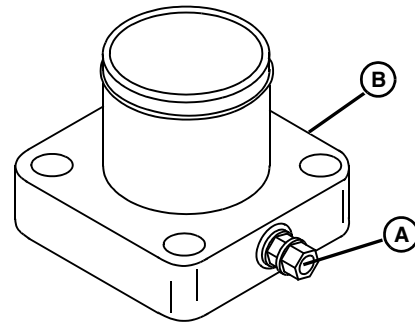
To test operation of manifold heater.

Equipment

- Ohmmeter

Procedure

1. Park machine safely with park brake locked. See Park Machine Safely in Safety section.
2. Raise hood and secure with prop rod.
3. Remove right side engine cover.
4. Remove manifold heater lead from terminal (A).
5. Check continuity across terminal (A) and manifold heater body (B). The reading should be between specifications.



A—Terminal

B—Manifold Heater Body

Results

If manifold heater unit does not have proper resistance, replace heater unit.

Specification

Manifold
Heater—Continuity.....0.3—0.5 ohms

KN52281,1004488 -19-16JAN13-1/1

LVAL11720—UN—02NOV10

Engine Coolant Temperature Sensor Test

Reason

To verify coolant temperature sensor is functioning properly.

Equipment

- Ohmmeter

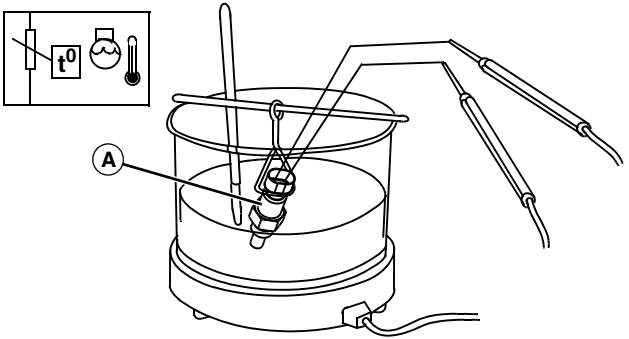
Procedure

NOTE: Perform test with engine at room temperature.

1. Park machine safely in neutral with park brake locked.
2. Raise hood and secure with prop rod.
3. Disconnect 359 Wht wire from engine coolant temperature sensor.
4. Measure resistance between terminal and sensor body.
5. If resistance does not meet specification, replace coolant temperature switch.
6. Drain engine coolant and remove coolant temperature sensor.
7. Place coolant temperature sensor (A) in antifreeze solution heated to specification. Measure resistance while coolant temperature sensor is heated. Reading should be approximately to specification.

Specification

Temperature
Sensor—Temperature
(approximately)..... 96°C (205°F)



A—Coolant Temperature Sensor

Temperature
Sensor—Resistance
(approximately)..... 64 ohms

8. If resistance does not meet specification, replace coolant temperature sensor.

Specification

Variable Resistance
Range—Full Clockwise.....22 ohms @135°C (275°F)
Full Counterclockwise.....520 ohms @40°C (104°F)

Engine Oil Pressure Switch Test

Reason

To determine if engine oil pressure switch is functioning properly, to warn operator that oil pressure has dropped below minimum operating pressure.

Equipment

- Ohmmeter

Procedure

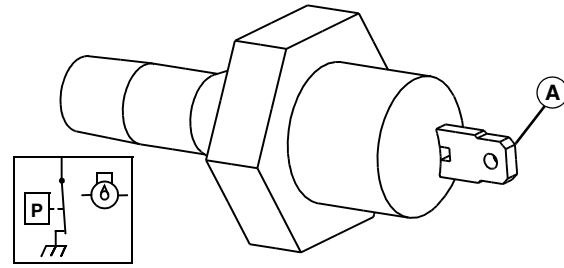
NOTE: Perform test with engine at room temperature.

1. Park machine safely in neutral with park brake locked.
2. Raise hood and secure with prop rod.
3. Disconnect 347A Pur wire from engine oil pressure switch terminal (A).
4. Connect black lead of ohmmeter to engine block and red lead of ohmmeter to terminal of switch.
5. Measure resistance between terminal and engine block.

Results

- There should be continuity between terminal and ground.
- If there is no continuity between terminal and ground; replace the oil pressure switch.

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A—Pressure Switch Terminal

NOTE: Be sure to apply Pipe Sealant with TEFLON™ to threads of switch anytime it is installed.

1. Start and run engine.
2. Measure resistance between terminal and engine block.

Results

There should be no continuity between switch terminal and ground with the engine running.

- If the switch does have continuity to engine block (ground) with engine running, check engine oil pressure.
- If oil pressure meets specification; replace the engine oil pressure switch.

LVAL11722 —UN—02NOV10

KN52281,100448A -19-16JAN13-1/1

Relay Test

Results

To check relay terminal continuity in the energized and de-energized condition.

Equipment

- Ohmmeter or continuity tester
- 12 volt battery and small jumper wires

Procedure 1

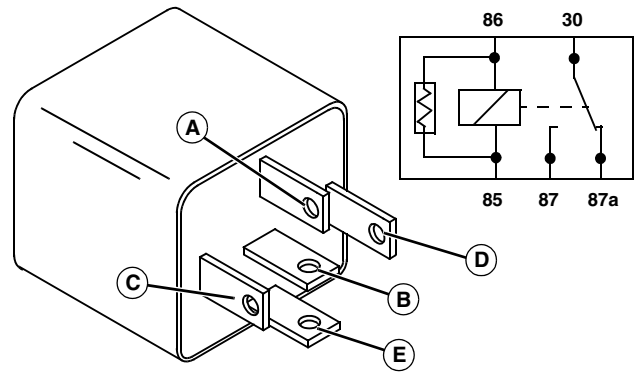
1. Park machine safely in neutral with park brake locked.
2. Open plastic panel below steering column support.
3. Remove relay from fuse and relay load center.
4. Check terminal continuity using an ohmmeter or continuity tester.

Results 1

- There should be continuity between terminals 30 (A) and 87a (B).
- There should be approximately 80 ohms resistance between terminals 85 (C) and 86 (D).
- There should not be continuity between any other terminals.

Procedure 2

1. Connect a small jumper wire from battery positive (+) terminal to relay terminal 85 (C).



A—Terminal 30
B—Terminal 87a
C—Terminal 85

D—Terminal 86
E—Terminal 87

2. Connect a small jumper wire from relay terminal 86 (D) to battery negative terminal (-).

Results 2

- There should be continuity between terminals 30 (A) and 87 (E).
- If continuity is not correct, replace relay.

LVAL11723—UN—02NOV10

KN52281,100448B -19-16JAN13-1/1

Key Switch Test

Reason

To verify that key switch functions properly.

Equipment

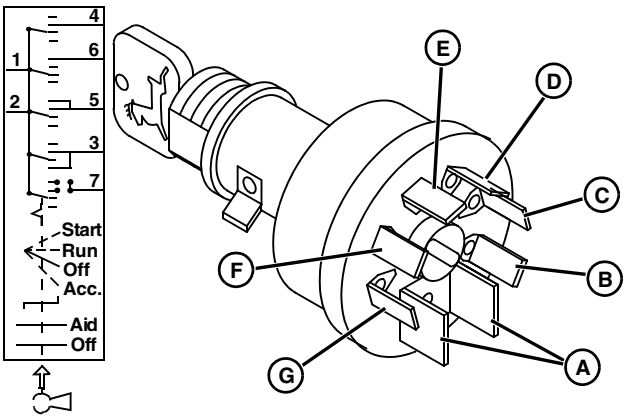
- Ohmmeter or continuity tester

Procedure

1. Park machine safely in neutral with park brake locked.
2. Raise hood and secure with prop rod.
3. Loosen left and right cowl panel and display panel enough to remove key switch. (See [Cowl Panel Removal and Installation](#) in Section 120, Group 10.)
4. Disconnect key switch from wiring harness.
5. Remove key switch and panel from machine.
6. Use an ohmmeter or continuity tester to test switch continuity in ACC, OFF, RUN, START, and AID (key pushed in) positions.

Key Switch Continuity Table						
Switch Position	Terminals					
	A	B	C	D	E	F
OFF	•					
ACC	•	•				
RUN	•	•	•	•		• (*)
START	•			•	•	• (*)

* Key switch pushed IN (AID position).



Key Switch

- A—BAT: Terminals 1 and 2
- B—ACC: Terminal 3
- C—ELX: Terminal 4
- D—IGN Terminal 5
- E—ST: Terminal 6
- F—AID: Terminal 7
- G—Spare

Results

- If any continuity is not correct, replace the switch.

KN52281,100448C -19-16JAN13-1/1

LVAL11724 —UN—02NOV10

Light Switch Test

Reason

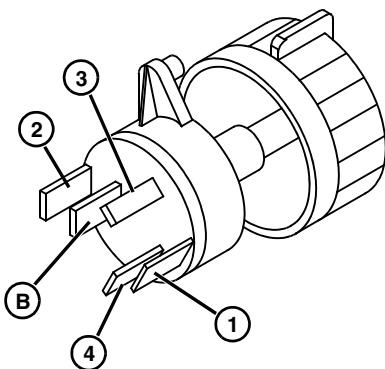
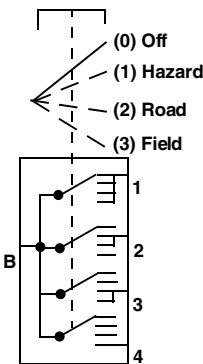
To verify that light switch functions properly.

Equipment

- Ohmmeter or continuity tester

Procedure

1. Park machine safely in neutral with park brake locked.
2. Raise hood and secure with prop rod.
3. Loosen left and right cowl panel and display panel enough to remove light switch. (See [Cowl Panel Removal and Installation](#) in Section 120, Group 10.)
4. Disconnect light switch from wiring harness.
5. Remove light switch from machine.
6. Use an ohmmeter or continuity tester to test switch continuity in OFF, HAZARD, ROAD, and FIELD positions.



LVAL11725—UN—02NOV10

- 1—Terminal 1 (not used)
- 2—Terminal 2
- 3—Terminal 3
- 4—Terminal 4
- B—Terminal B (BAT)

Light Switch Continuity Table					
Switch Position	Terminals				
	B	1	2	3	4
OFF	•	•			
HAZARD	•	•	•		
ROAD	•	•	•	•	
FIELD	•	•		•	•

Results

- If any continuity is not correct, replace the switch.

KN52281,100448D -19-16JAN13-1/1

Sensing Switch Test

Reason

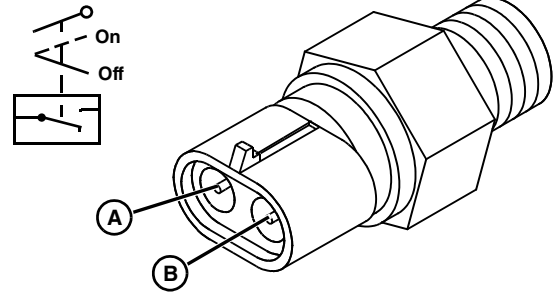
To verify that sensing switches used for transmission neutral, MFWD, rear PTO, and mid PTO function sensing are operating properly.

Equipment

- Ohmmeter or continuity tester

Procedure

1. Park machine safely in neutral with park brake locked.
2. Disconnect switch to be tested from wiring harness.
3. Check continuity across switch terminals A and B. Continuity for each circuit should exist when:
 - Transmission is in neutral.
 - MFWD is on.
 - Mid PTO is off.
 - Rear PTO is engaged.
4. Move the lever for the circuit being tested. Check for continuity through switch. There should be no continuity when:
 - Transmission is in any gear.
 - MFWD is off.
 - Mid PTO is on.
 - Rear PTO is disengaged.
5. If continuity does not match specifications:



LVAL11726—UN—02NOV10

A—Terminal

B—Terminal

- Remove switch.
- Test switch for continuity. The switch is normally open. Depress contact ball on end of switch and check continuity.

Specification

Sensing Switch—Contact

Ball Pushed

In—Resistance..... 0 ohms:
Continuity between terminals A and B.

Sensing Switch—Contact

Ball Released—Resis-

tance..... Infinite: No
continuity between terminals A and B.

6. Replace switch if correct continuity can not be obtained.

KN52281,100448E -19-16JAN13-1/1

Turn Signal Switch Test

Reason

To verify that turn signal switch functions properly.

Equipment

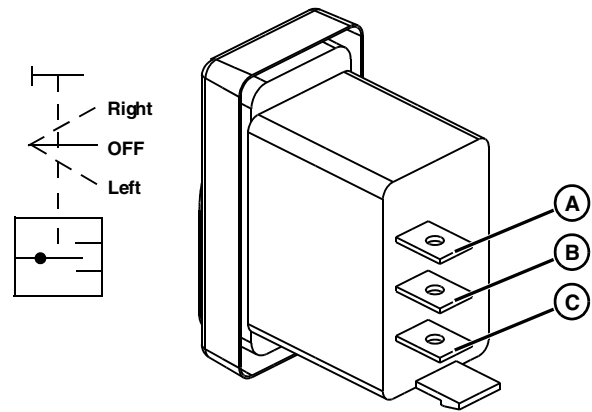
- Ohmmeter or continuity tester

Procedure

1. Park machine safely in neutral with park brake locked.
2. Raise hood and secure with prop rod.
3. Loosen left and right cowl panel and display panel enough to remove turn signal switch. (See [Cowl Panel Removal and Installation](#) in Section 120, Group 10.)
4. Disconnect turn signal switch from wiring harness.
5. Use an ohmmeter or continuity tester to test switch continuity in OFF, LEFT, and RIGHT positions.

Turn Signal Switch Continuity Table

OFF	None
RIGHT	A and B
LEFT	B and C



A—Terminal RIGHT
B—Terminal OFF

C—Terminal LEFT

Results

- If continuity is not correct, or exists in any other combination than shown above, replace the switch.

KN52281,100448F -19-16JAN13-1/1

LVAL11727—UN—02NOV10

Rear PTO Switch Test

Reason

To verify proper operation of the rear PTO switch.

Equipment

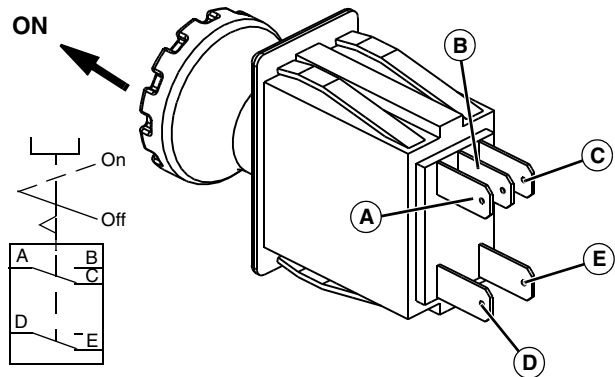
- Ohmmeter

Procedure

1. Park machine safely in neutral with park brake locked.
2. Raise hood and secure with prop rod.
3. Loosen left and right cowl panel and display panel enough to remove rear PTO switch. (See [Cowl Panel Removal and Installation](#) in Section 120, Group 10.)
4. Disconnect rear PTO switch from wiring harness.
5. Use an ohmmeter or continuity tester to test switch continuity in off and on positions.

Rear PTO Switch Continuity Table

OFF	A and C
OFF	D and E
ON	A and B



A—Normally Closed Terminal
B—Normally Open Terminal
C—Common Terminal

D—Normally Closed Terminal
E—Common Terminal

Results

- If continuity is not correct or is present in any other combination, replace rear PTO switch.

KN52281,1004490 -19-16JAN13-1/1

LVAL11728—UN—02NOV10

Rear PTO Switch Test—MY13

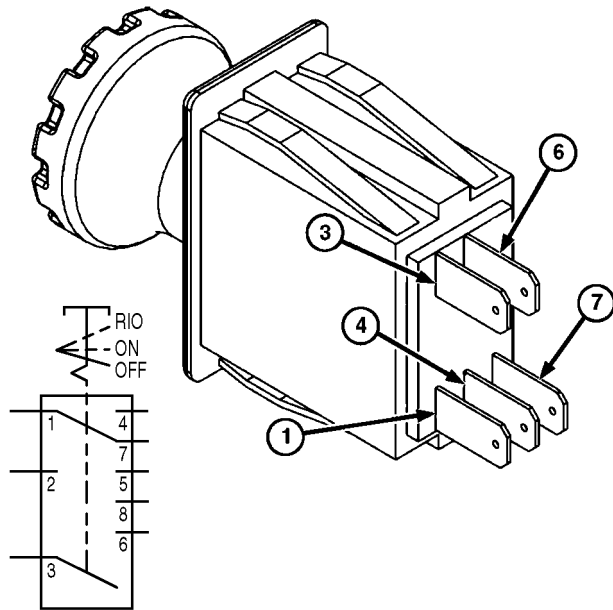
Reason

To verify proper operation or the rear PTO switch.

Equipment

- Ohmmeter

Procedure



1— Common Terminal
4— Normally Open

3— Common Terminal
6— Momentary

7— Normally Closed

1. Disconnect switch.
2. Use ohmmeter to check continuity across switch terminals.
 - a. If continuity is not present between terminals listed for each switch position, replace switch.
 - b. If continuity exists between terminals not listed for each switch position, replace switch.

Switch Continuity	
Off	1 — 7
On	1 — 4
RIO	3 — 6

LVAL38745 —UN—15OCT12

KN52281,1004491 -19-16JAN13-1/1

Rear PTO Solenoid Tests

Reason

To verify that the solenoid coil is operating properly.

Equipment

- Ohmmeter or continuity tester

Procedure

1. Park machine safely in neutral with park brake locked.
2. Access the solenoids on the right side of the machine under the operator's floor platform.
3. Disconnect the solenoids from wiring harness.
4. Use an ohmmeter or continuity tester, check if continuity exist between solenoid terminals.
5. If resistance does not meet specifications or is present in any other combination, replace solenoid.

Specification

Rear PTO
Solenoid—Resistance..... 8.5 ohms



A—Terminal

B—Terminal

- Check for grounds or shorts by connecting tester to one coil terminal and the other to bare metal of coil case.

Results

- Replace solenoid if continuity is present from either terminal to solenoid coil case.

LVAL11729 —UN—02NOV10

KN52281,1004492 -19-16JAN13-1/1

Seat Switch Test

Reason

To verify that seat switch functions properly.

Equipment

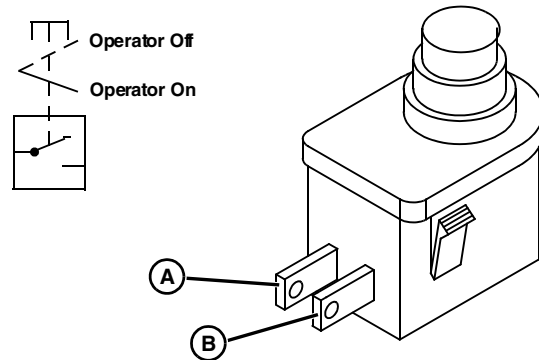
- Ohmmeter or continuity tester

Procedure

1. Park machine safely in neutral with park brake locked.
2. Raise seat.
3. Disconnect seat switch from wiring harness.
4. Check continuity across switch terminals A and B. There should be no continuity.
5. Depress seat switch plunger. Continuity should exist between terminals A and B.

Results

- If continuity is not correct, replace seat switch.



A—Terminal

B—Terminal

LVAL11730 —UN—02NOV10

KN52281,1004493 -19-16JAN13-1/1

Cruise/Max Speed Switch Test—eHydro™/Auto HST

Reason

To verify that the cruise control switch functions properly.

Equipment

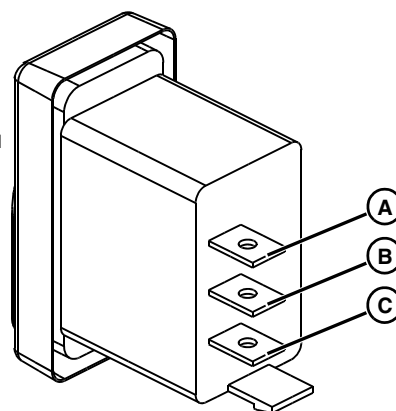
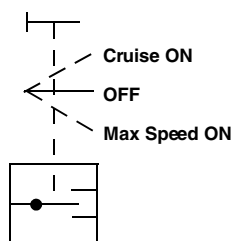
- Ohmmeter or continuity tester

Procedure

1. Park machine safely in neutral with park brake locked.
2. Open the right side control panel to access the cruise control switch.
3. Disconnect cruise control switch from wiring harness.
4. Use an ohmmeter or continuity tester to test switch continuity.

Cruise/Max Speed Switch Continuity Table

OFF	None
Cruise ON	A and B
Max Speed ON	B and C



A—Terminal (Cruise)
B—Terminal (Common)

C—Terminal (Max Speed)

Results

- If continuity is not correct, or exists in any other combination than shown above, replace the switch.

KN52281,1004494 -19-16JAN13-1/1

LVAL11731—UN—02NOV10

Res/+, Set/- Switch Test—eHydro™/Auto HST

Reason

To verify proper operation of the Res/+, Set/- switch.

Equipment

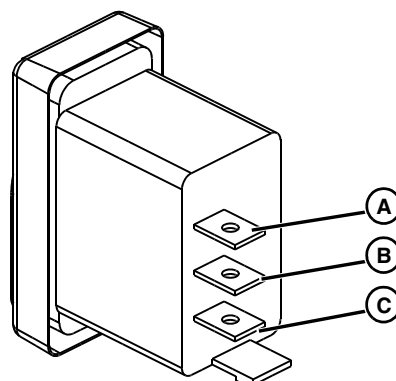
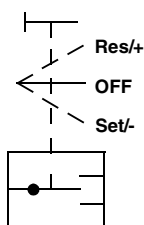
- Ohmmeter or continuity tester

Procedure

1. Park machine safely in neutral with park brake locked.
2. Open the right side control panel to access the Res/+, Set/- switch.
3. Disconnect Res/+, Set/- switch from wiring harness.
4. Use an ohmmeter or continuity tester to test switch continuity.

Res/+, Set/- Switch Continuity Table

OFF	None
Cruise ON	A and B
Max Speed ON	B and C



A—Terminal (Res/+)
B—Terminal (Common)

C—Terminal (Set/-)

- If continuity is not correct, or exists in any other combination than shown above, replace the switch.

KN52281,1004495 -19-16JAN13-1/1

LVAL11732—UN—02NOV10

Results

NOTE: This switch is a momentary switch. The switch should return to the off position when released.

Brake and Park Brake Switch Test

Reason

To verify that the brake and park brake switches function properly.

Equipment

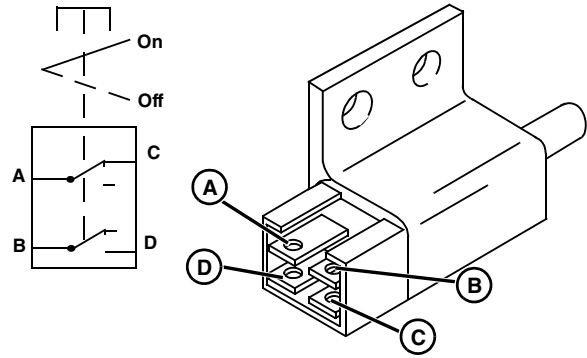
- Ohmmeter or continuity tester

Test Procedure

1. Park machine safely in neutral with park brake locked.
2. Access the park brake on the left side of the machine behind the seat base close-out panel.
3. Access the brake switch (eHydro™) on the left side of the machine under the operator's floor platform.
4. Disconnect switch to be tested from wiring harness.
5. Use an ohmmeter or continuity tester to test switch continuity.

Brake and Park Brake Switch Continuity Table

OFF	None
Released	A and D
Pushed	B and C



A—Terminal (N.C.)
B—Terminal (N.O.)

C—Terminal (N.O.)
D—Terminal (N.C.)

Results

- If continuity is not correct, or exists in any other combination than shown above, replace the switch.

KN52281,1004496 -19-16JAN13-1/1

Air Filter Restriction Switch Test

Reason

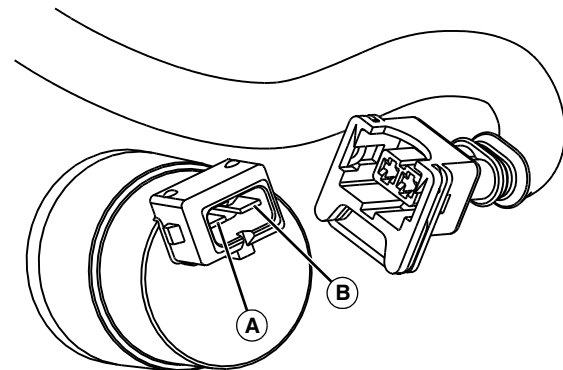
To determine if the air filter restriction switch is detecting air flow resistance through the air filter.

Equipment

- Ohmmeter or continuity tester
- A piece of cardboard or plywood to cover the air cleaner intake tube.

Procedure

1. Park machine safely in neutral with park brake locked.
2. Raise hood and secure with prop rod.
3. Disconnect air filter restriction switch and connect ohmmeter test leads across switch terminals (A and B).
4. Start and operate engine at slow idle.
5. Cover the air cleaner intake tube with a piece of cardboard or plywood.
6. Move throttle lever to high idle.
7. Observe ohmmeter reading.



A—Terminal

B—Terminal

Results

- There should be no continuity present when the air intake tube is open for full air flow. If continuity is present, replace air filter restriction switch.
- There should be continuity present when the air intake tube is blocked with the cardboard or plywood. If no continuity is present, replace air filter restriction switch.

KN52281,1004497 -19-16JAN13-1/1

Fuel Gauge Sensor Test

Reason

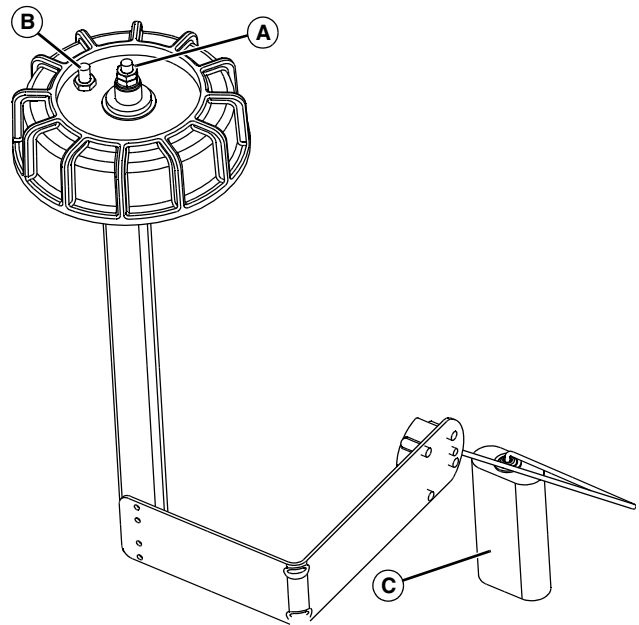
To verify that the fuel gauge sensor is operating properly.

Equipment

- Ohmmeter or continuity tester

Test Procedure

1. Park machine safely in neutral with park brake locked.
2. Raise hood and secure with prop rod.
3. Turn key switch to on position.
4. Disconnect 353A Org wire (A) from fuel sensor and check fuel gauge. The fuel gauge must drop to empty. If not, (See [Power Circuit Operation](#) in Section 40, Group 35.)
5. Short the 353A Org wire (A) to the 050B Blk wire (B) connector on the fuel sensor. The gauge must rise to full. If not, test the fuel sensor ground circuit.
6. If the gauge does not correctly indicate fuel levels based on the two tests above, proceed to step 9.
7. Disconnect 050B Blk wire (B) from fuel sensor.
8. Remove sensor from fuel tank.
9. Using an ohmmeter connected to fuel gauge sensor contacts, check if continuity exists between terminals. If continuity exists, measure resistance across terminals as float and float arm (C) are moved through full range of motion.



A—353A Org Wire
B—050B Blk Wire

C—Float Arm

Specification

Fuel Gauge
Sensor—Resistance
(variable)..... 5—95 ohms

Results

- If resistance does not meet specifications, replace fuel gauge sensor.

KN52281,1004498 -19-16JAN13-1/1

LVAL11735—UN—02NOV10

Fuel Shutoff Solenoid Test

Reason

To verify that the fuel shutoff solenoid is operating properly.

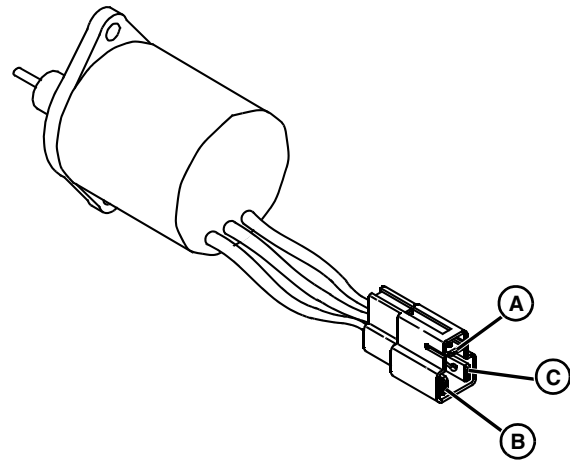
Equipment

- Ohmmeter

Procedure

1. Park machine safely in neutral with park brake locked.
2. Raise hood and secure with prop rod.
3. Locate the fuel shutoff solenoid connector under the air cleaner and disconnect fuel shutoff solenoid connector.
4. Measure and record the resistance across each combination of terminals as listed below.
5. The red lead (+) position of the meter is listed down the side and the black lead (-) position of the meter is listed across the top of the chart.

	Blk Wire (A)	Red Wire (B)	Wht Wire (C)
Blk Wire (A)		12	0.4
Red Wire (B)	12		12.4
Wht Wire (C)	0.4	12.4	



A—Blk Wire
B—Red Wire

C—Wht Wire

6. Connect fuel shutoff solenoid connector.

Results

- If continuity is not correct, replace fuel shutoff solenoid.

KN52281,1004499 -19-16JAN13-1/1

LVAL11736—UN—02NOV10

Load Match Switch Test—eHydro™

Reason

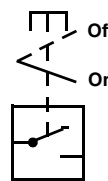
To verify proper operation of the load match switch.

Equipment

- Ohmmeter or continuity tester

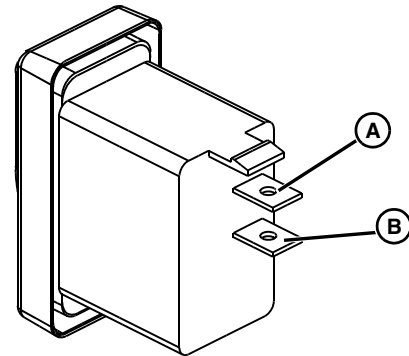
Procedure

1. Park machine safely in neutral with park brake locked.
2. Raise hood and secure with prop rod.
3. Loosen left and right cowl panel and display panel enough to remove load match switch. See Cowl Removal and Installation in the Miscellaneous Section.
4. Disconnect load match switch from wiring harness.
5. Check continuity across switch terminals A and B. There should be no continuity in the off position.
6. Toggle the switch to the on position. Continuity should exist between terminals A and B.



A—Terminal

B—Terminal



Results

- If continuity is not correct, replace load match switch.

KN52281,100449A -19-16JAN13-1/1

LVAL11737—UN—02NOV10

Motion Match Switch Test—eHydro™/Auto HST

Reason

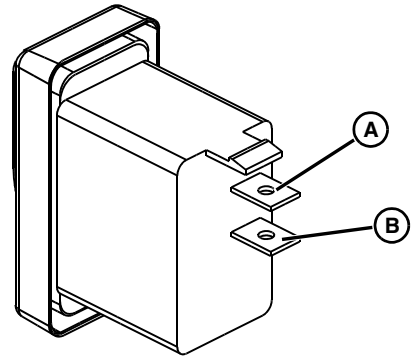
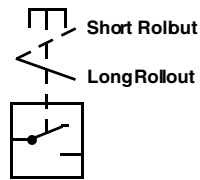
To verify proper operation of the motion match switch.

Equipment

- Ohmmeter or continuity tester

Procedure

1. Park machine safely in neutral with park brake locked.
2. Open the right side control panel to access the motion match switch.
3. Disconnect motion match switch from wiring harness.
4. Check continuity across switch terminals A and B. There should be no continuity in the short rollout position.
5. Toggle the switch to the long rollout position. Continuity should exist between terminals A and B.



A—Terminal

B—Terminal

Results

- If continuity is not correct, replace motion match switch.

KN52281,100449B -19-16JAN13-1/1

LVAL11738—UN—02NOV10

Display Mode Switch Test

Reason

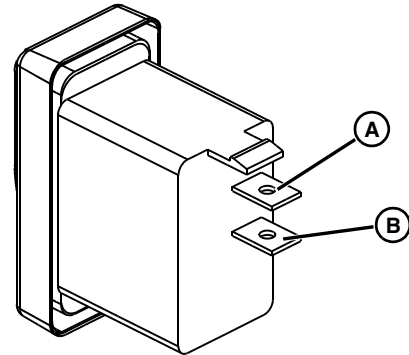
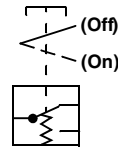
To verify proper operation of the display mode switch.

Equipment

- Ohmmeter or continuity tester

Procedure

1. Park machine safely in neutral with park brake locked.
2. Raise hood and secure with prop rod.
3. Loosen left and right cowl panel and display panel enough to remove display mode switch.
4. Disconnect display mode switch from wiring harness.
5. Check continuity across switch terminals A and B. There should be no continuity in the off position.
6. Toggle the switch to the on position. Continuity should exist between terminals A and B.



A—Terminal

B—Terminal

Results

NOTE: This switch is a momentary switch. The switch should return to the off position when released.

- If continuity is not correct, replace display mode switch.

KN52281,100449C -19-16JAN13-1/1

LVAL11739—UN—02NOV10

Proportional Drive Solenoid Test—eHydro™/Auto HST

Reason

To verify proper operation of the proportional drive solenoid coil.

Equipment

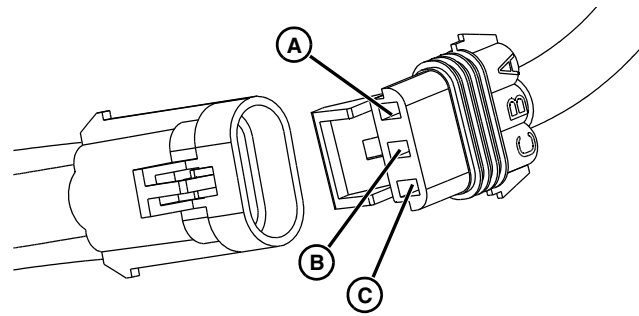
- Ohmmeter or continuity tester

Procedure

1. Park machine safely in neutral with park brake locked.
2. Access the X27 connector to the drive solenoids on the right side of the machine under the operator's floor platform.
3. Disconnect the valve wiring harness from the main wiring harness.
4. Use an ohmmeter or continuity tester, check if continuity exist between connector terminals.
5. If resistance does not meet specifications or is present in any other combination, replace solenoid.

Proportional Drive Solenoid—Specification

Terminals C (Blk Wire) and A (Blu Wire)—Resistance..... 3.85 ± 1.0 ohms



A—Terminal (Blu Wire)
B—Terminal (Pur Wire)

C—Terminal (Blk Wire)

Specification

Terminals C (Blk Wire) to B (Pur Wire)—Resistance..... 3.85 ± 1.0 ohms
Terminals A (Blu Wire) to B (Pur Wire)—Resistance..... 7.7 ± 1.0 ohms

LVAL11740 —UN—02NOV10

KN52281,100449D -19-16JAN13-1/1

Horn Switch Test

Reason

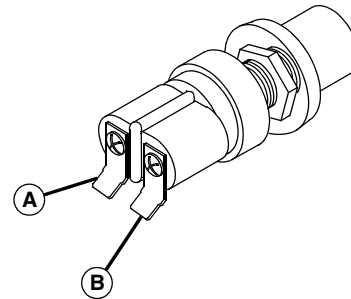
To verify the horn switch is operating properly.

Equipment

- Ohmmeter or continuity tester

Procedure

1. Park machine safely in neutral with park brake locked.
2. Remove instrument panel enough to remove horn switch.
3. Disconnect the horn switch connectors from the switch.
4. With the button released, check continuity across both switch terminals (A) and (B). There should be no continuity.
5. Depress the horn switch button. Continuity should exist between both terminals (A) and (B).



A—Terminal

B—Terminal

Results

- If continuity is not correct, replace horn switch.

LVAL11741 —UN—02NOV10

KN52281,100449E -19-16JAN13-1/1

FNR Switch Test—Auto HST

Reason

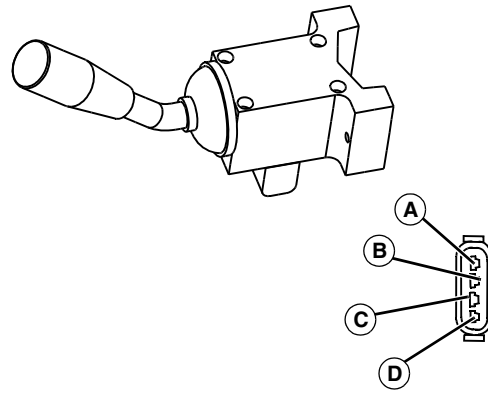
To verify the operation of the Drive—Neutral—Reverse switch.

Equipment

- Ohmmeter or continuity tester

Procedure

1. Park machine safely. See “Parking Safely” in the Safety section.
2. Access the FNR switch underneath the steering column rubber boot.
3. Disconnect FNR switch connector and check continuity at switch.
4. With switch in neutral position, check for continuity between (A) and (C).
5. With switch in forward position, check for continuity between (A) and (B).
6. With switch in reverse position, check for continuity between (A) and (D).



A—Pin to Red wire
B—Pin to Org wire

C—Pin to Wht wire
D—Pin to Org wire

Result

- If continuity is not correct, or if there is continuity between any other pins not specified in test, replace FNR switch.

LVAL11742 —UN—02NOV10

KN52281,100449F -19-16JAN13-1/1

Display Panel Fault Codes—Auto HST/eHydro™

Purpose:

To provide the operator and the technician with information that will aid in the diagnosis of operational problems that may occur.

Operation:

During normal operation the display panel will show the hours of operation on the engine.

A fault code will be displayed when an operational command input is supplied to the display panel or the electronic drive controller on eHydro™ and Auto HST machines, and any one or more parts of that circuit output are not operating properly.

The fault code will be displayed that will help identify the problem. If more than one fault exists the lowest number code will be displayed. When that fault is corrected, the

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next fault code in numerical sequence will be displayed. Each fault will have to be corrected and cleared one by one should there be multiple faults.

Once a code has been displayed, it can be matched to the fault code chart to explain what the display panel logic is reading as a problem, and what corrective action is needed to positively identify and correct the source of the fault.

NOTE: When taking the required action to correct a fault, use the built in diagnostics of the display panel. (See Entering Diagnostic and Calibration Modes.)

Fault codes 01 through 49 are associated to the eHydro/Auto HST drive control operation. Fault codes 50 through 99 are associated to the display functions.

Diagnostic fault codes can also be read by using Service ADVISOR™. (See Retrieving Diagnostic Trouble Codes with Service ADVISOR™ Diagnostic Application™.)

KN52281,10044A0 -19-02NOV12-1/1

Display Panel Fault Code Chart—eHydro™

Display Value	Description	Cause of Fault	Result of Fault	Required Action
Err 01	Forward and Reverse Pedals	Both the pedals are depressed.	Machine does not drive.	Release both the pedals and depress one at a time.
Err 02	Forward Pedal	Voltage signal out-of-range or not calibrated.	Machine does not drive.	Calibrate the sensor. Check the sensor and 686 Lt Blu wire and connections.
Err 03	Reverse Pedal	Voltage signal out-of-range or not calibrated.	Machine does not drive.	Calibrate the sensor. Check the sensor and 687 Pur wire and connections.
Err 04	Engine Speed	No signal at Engine Speed input.	No anti-stall or cruise functions; Loss of performance.	Check the 325A, 325B and 325C Grn wires and connections for short or open circuit.
Err 05	Brake and Cruise Set/Decel Switch	Cruise control Set/Decel switch depressed while brake is engaged.	No cruise function.	Release brake pedal. Adjust or repair brake switch. Check 247 Pur wire and connections for short or open circuit.
Err 06	MFWD Speed	No signal at MFWD speed input.	No cruise function; Loss of performance.	Test MFWD sensor. Check that MFWD is fully engaged. Check 502 Red wire and connections for short or open circuit.
Err 07	Cruise Set/Decel Switch	Cruise Set/Decel switch is held or stuck on.	No cruise function.	Check 238 Gry and 265 Grn wires and connections for short circuit to battery voltage. Test the cruise set/decels switch.
Err 08	Throttle Sensor	Voltage signal out-of-range or not calibrated.	No anti-stall function; Loss of performance.	Calibrate the sensor. Check the sensor and 499 Wht wire and connections.
Err 09	Cruise On/Off and Set Max Speed switches	Cruise and Max Speed inputs are both active	No cruise function	Test the cruise/max speed switch. Check 238 Gry and 267 Pur wires and connections for short circuit to battery voltage.
Err 10	No application	NA	Machine does not drive.	Program the eHydro™ controller with the latest application software.
Err 11	Cruise Set/Decel and Cruise Res/Accel switches	Set/Decel and Resume/Accel switches are both active.	No cruise function.	Test the cruise res/+, set/- switch. Check the 266 Blu and 265 Grn wires and connections for short circuit to battery voltage.
Err 12	Sensor Supply voltage	Voltage is out-of-range.	Machine does not drive.	Check the 673 series of wires and connections for a short or open circuit.
Err 13	No application	NA	Machine does not drive.	Program the eHydro™ controller with the latest application software.
Err 14	Pump Current	Coil resistance too high (open) or too low (short).	Machine does not drive.	Test the proportional valve coils. Check 696 Blu and 697 Pur wires and connections for short or open circuit.
Err 15	Operator Present	Operator not in the seat.	Machine does not drive.	Test seat switch. Check 539C, 539B and 539A Wht wires and connections for open circuit.
Err 50	EOL Faults Size	Fault Table size is not compatible with the Application.	Display and eHydro™ Error Codes might not be displayed.	Update the display to the latest application and configuration data.
Err 51	EOL EEPROM Size	EEPROM Default Parameter table size is not compatible with the Application.	Default configuration settings could be incorrect.	Update the display to the latest application and configuration data.

Continued on next page

KN52281,10044A1 -19-02NOV12-1/3

Display Panel Tests and Adjustments

Err 52	eHydro™ Faults Size	eHydro™ fault list does not match Display fault list.	eHydro™ Error Codes might not displayed.	Update the display to the latest application and configuration data.
Err 53	EOL Major Version	EOL Data structure is incompatible with application.	Loss of performance.	Update the display to the latest application and configuration data.
Err 54	EOL Minor Version	EEPROM Data is updated.	EEPROM Data Level 1 and 2 are reset to EOL Data.	Turn the key switch OFF, wait 3-4 seconds and turn back ON. If error continues, update to the latest software.
Err 55	EEPROM Checksum	EEPROM failure—the values have been reset to defaults, resets the hour meter.	EEPROM Data is reset to EOL Data, Resets the hour meter.	Turn the key switch OFF, wait 3-4 seconds and turn back ON. If error continues, update to the latest software.
Err 56	eHydro™ Unable to Send	Critical eHydro™ messages are missing.	Loss of features.	Check the communication harness between the display and eHydro™ controller. Connectors X5 and X4, wires 924 Yel and 925 Grn wires.
Err 57	eHydro™ Timeout	No response from eHydro™ controller.	Loss of features.	Check the communication harness between the display and eHydro™ controller. Connectors X5 and X4, wires 924 Yel and 925 Grn.
Err 58	eHydro™ Compatibility	eHydro™ communication structure is not compatible with Display communication structure.	Loss of features.	Update the display to the latest application and configuration data. If the error continues, update the eHydro™ controller with the latest Application software.
Err 59	VIN not same	eHydro™ VIN does not match the Display VIN.	eHydro™ or Display is programmed with wrong VIN.	Check and update the VIN in both the display and the eHydro™ controller.
Err 60	Right Red Lamp ON	Output from the Display is short circuit.	No right turn signal on the ROPS.	Check the right turn signal bulb. Check the 143 Org wire for short to ground. (See Turn Signal Lights Circuit Operation—Pre MY08.)
Err 61	Right Red Lamp OFF	Output from the Display is open.	No right turn signal on the ROPS.	Check the right turn signal bulb. Check the 143 Org wire for short to battery voltage or open circuit. (See Turn Signal Lights Circuit Operation—Pre MY08.)
Err 62	Left Red Lamp ON	Output from the Display is short circuit.	No left turn signal on the ROPS	Check the left turn signal bulb. Check the 133 Org wire for short to ground. (See Turn Signal Lights Circuit Operation—Pre MY08.)
Err 63	Left Red Lamp OFF	Output from the Display is open.	No left turn signal on the ROPS.	Check the left turn signal bulb. Check the 133 Org wire for short to battery voltage or open circuit. (See Turn Signal Lights Circuit Operation—Pre MY08.)
Err 64	Right Amber Lamp ON	Output from the Display is short circuit.	No right hazard signal on the ROPS.	Check the right hazard light bulb. Check the 135 Grn wire for short to ground. (See Light Circuit Operation.)

Continued on next page

KN52281,10044A1 -19-02NOV12-2/3

Display Panel Tests and Adjustments

Err 65	Right Amber Lamp OFF	Output from the Display is open.	No right hazard signal on the ROPS.	Check the right hazard light bulb. Check the 135 Grn wire for short to battery voltage or open circuit. (See Light Circuit Operation .)
Err 66	Left Amber Lamp ON	Output from the Display is short circuit.	No left hazard signal on the ROPS.	Check the left hazard light bulb. Check the 145 Grn wire for short to ground. (See Light Circuit Operation .)
Err 67	Left Amber Lamp OFF	Output from the Display is open.	No left hazard signal on the ROPS.	Check the left hazard light bulb. Check the 145 Grn wire for short to battery voltage or open circuit. (See Light Circuit Operation .)
Err 68	Pull-in Relay ON	Output from the display is short circuit.	No fuel to the engine.	Check the pull-in coil relay. Check the 304 Yel wire for short to ground. (See Fuel Supply/Engine Shutoff Circuit Operation .)
Err 69	Pull-in Relay OFF	Output from the display is open.	No fuel to the engine.	Check the pull-in coil relay. Check the 304 Yel wire for short to battery voltage or open circuit. (See Fuel Supply/Engine Shutoff Circuit Operation .)
Err 72	Starter Relay ON	Output from the Display is short circuit.	Can not crank the engine.	Check the start relay. Check the 518 Gry wire for short to ground. (See Cranking Circuit Operation (NA) .)
Err 73	Starter Relay OFF	Output from the Display is open.	Can not crank the engine.	Check the start relay. Check the 518 Gry wire for short to battery voltage or open circuit. (See Cranking Circuit Operation (NA) .)
Err 74	Display Mode Switch	The LCD Display Mode/Configuration input is stuck on.	No acknowledgement of errors. No other info selectable. No eHydro™ commands selectable.	Test the display mode switch. Check 908 Gry wire and connections. (See Display Mode Switch Circuit Operation .)
Err 75	Invalid VIN	Invalid VIN or VIN has not been programmed	Display could be programmed with wrong VIN	Check and update the VIN in both the display and the eHydro™ controller.
Err 76	VIN Type	VIN type does not match the unit type	Display could be programmed with wrong chassis type	Update the display to the latest application and configuration data. Update VIN in the display.
Err 77	EOL VIN Type	EOL VIN type does not match the chassis type	Display could be programmed with wrong chassis type	Update the display to the latest application and configuration data. Update VIN in the display.

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Display Panel Fault Code Chart

MY13—eHydro™

Display Value	Description	Cause of Fault	Result of Fault	Required Action
Err 01	Forward and Reverse Pedals	Both the pedals are depressed.	Machine does not drive.	Release both the pedals and depress one at a time.
Err 02	Forward Pedal	Voltage signal out-of-range or not calibrated.	Machine does not drive.	Calibrate the sensor. Check the sensor and 686 Lt Blu wire and connections.
Err 03	Reverse Pedal	Voltage signal out-of-range or not calibrated.	Machine does not drive.	Calibrate the sensor. Check the sensor and 687 Pur wire and connections.
Err 04	Engine Speed	No signal at Engine Speed input.	No anti-stall or cruise functions; Loss of performance.	Check the 325A, 325B and 325C Grn wires and connections for short or open circuit.
Err 05	Brake and Cruise Set/Decel Switch	Cruise control Set/Decel switch depressed while brake is engaged.	No cruise function.	Release brake pedal. Adjust or repair brake switch. Check 247 Pur wire and connections for short or open circuit.
Err 06	MFWD Speed	No signal at MFWD speed input.	No cruise function; Loss of performance.	Test MFWD sensor. Check that MFWD is fully engaged. Check 502 Red wire and connections for short or open circuit.
Err 07	Cruise Set/Decel Switch	Cruise Set/Decel switch is held or stuck on.	No cruise function.	Check 238 Gry and 265 Grn wires and connections for short circuit to battery voltage. Test the cruise set/dec el switch.
Err 08	Throttle Sensor	Voltage signal out-of-range or not calibrated.	No anti-stall function; Loss of performance.	Calibrate the sensor. Check the sensor and 499 Wht wire and connections.
Err 09	Cruise On/Off and Set Max Speed switches	Cruise and Max Speed inputs are both active.	No cruise function.	Test the cruise/max speed switch. Check 238 Gry and 267 Pur wires and connections for short circuit to battery voltage.
Err 10	No application	NA	Machine does not drive.	Program the eHydro™ controller with the latest application software.
Err 11	Cruise Set/Decel and Cruise Res/Accel switches	Set/Decel and Resume/Accel switches are both active.	No cruise function.	Test the cruise res/+, set/- switch. Check the 266 Blu and 265 Grn wires and connections for short circuit to battery voltage.
Err 12	Sensor Supply voltage	Voltage is out-of-range.	Machine does not drive.	Check the 673 series of wires and connections for a short or open circuit.
Err 13	No application	NA	Machine does not drive.	Program the eHydro™ controller with the latest application software.
Err 14	Pump Current	Coil resistance too high (open) or too low (short).	Machine does not drive.	Test the proportional valve coils. Check 696 Blu and 697 Pur wires and connections for short or open circuit.
Err 15	Operator Present	Operator not in the seat.	Machine does not drive.	Test seat switch. Check 539C, 539B and 539A Wht wires and connections for open circuit.
Err 50	EOL Faults Size	Fault Table size is not compatible with the Application.	Display and eHydro™ Error Codes might not be displayed.	Update the display to the latest application and configuration data.

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Display Panel Tests and Adjustments

Err 51	EOL EEPROM Size	EEPROM Default Parameter table size is not compatible with the Application.	Default configuration settings could be incorrect.	Update the display to the latest application and configuration data.
Err 52	eHydro™ Faults Size	eHydro™ fault list does not match Display fault list.	eHydro™ Error Codes might not displayed.	Update the display to the latest application and configuration data.
Err 53	EOL Major Version	EOL Data structure is incompatible with application.	Loss of performance.	Update the display to the latest application and configuration data.
Err 54	EOL Minor Version	EEPROM Data is updated.	EEPROM Data Level 1 and 2 are reset to EOL Data.	Turn the key switch OFF, wait 3-4 seconds and turn back ON. If error continues, update to the latest software.
Err 55	EEPROM Checksum	EEPROM failure—the values have been reset to defaults, resets the hour meter.	EEPROM Data is reset to EOL Data, Resets the hour meter.	Turn the key switch OFF, wait 3-4 seconds and turn back ON. If error continues, update to the latest software.
Err 56	eHydro™ Unable to Send	Critical eHydro™ messages are missing.	Loss of features.	Check the communication harness between the display and eHydro™ controller. Connectors X5 and X4, wires 924 Yel and 925 Grn wires.
Err 57	eHydro™ Timeout	No response from eHydro™ controller.	Loss of features.	Check the communication harness between the display and eHydro™ controller. Connectors X5 and X4, wires 924 Yel and 925 Grn.
Err 58	eHydro™ Compatibility	eHydro™ communication structure is not compatible with Display communication structure.	Loss of features.	Update the display to the latest application and configuration data. If the error continues, update the eHydro™ controller with the latest Application software.
Err 59	VIN not same	eHydro™ VIN does not match the Display VIN.	eHydro™ or Display is programmed with wrong VIN.	Check and update the VIN in both the display and the eHydro™ controller.
Err 60	Right Red Lamp ON	Output from the Display is short circuit.	No right turn signal on the ROPS.	Check the right turn signal bulb. Check the 143 Org wire for short to ground. (See Turn Signal Lights Circuit Operation—Pre MY08.)
Err 61	Right Red Lamp OFF	Output from the Display is open.	No right turn signal on the ROPS.	Check the right turn signal bulb. Check the 143 Org wire for short to battery voltage or open circuit. (See Turn Signal Lights Circuit Operation—Pre MY08.)
Err 62	Left Red Lamp ON	Output from the Display is short circuit.	No left turn signal on the ROPS.	Check the left turn signal bulb. Check the 133 Org wire for short to ground. (See Turn Signal Lights Circuit Operation—Pre MY08.)
Err 63	Left Red Lamp OFF	Output from the Display is open.	No left turn signal on the ROPS.	Check the left turn signal bulb. Check the 133 Org wire for short to battery voltage or open circuit. (See Turn Signal Lights Circuit Operation—Pre MY08.)
Err 64	Right Amber Lamp ON	Output from the Display is short circuit.	No right hazard signal on the ROPS.	Check the right hazard light bulb. Check the 135 Grn wire for short to ground. (See Light Circuit Operation.)

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Display Panel Tests and Adjustments

Err 65	Right Amber Lamp OFF	Output from the Display is open.	No right hazard signal on the ROPS.	Check the right hazard light bulb. Check the 135 Grn wire for short to battery voltage or open circuit. (See Light Circuit Operation .)
Err 66	Left Amber Lamp ON	Output from the Display is short circuit.	No left hazard signal on the ROPS.	Check the left hazard light bulb. Check the 145 Grn wire for short to ground. (See Light Circuit Operation .)
Err 67	Left Amber Lamp OFF	Output from the Display is open.	No left hazard signal on the ROPS.	Check the left hazard light bulb. Check the 145 Grn wire for short to battery voltage or open circuit. (See Light Circuit Operation .)
Err 68	Pull-in Relay ON	Output from the display is short circuit.	No fuel to the engine.	Check the pull-in coil relay. Check the 304 Yel wire for short to ground. (See Fuel Supply/Engine Shutoff Circuit Operation .)
Err 69	Pull-in Relay OFF	Output from the display is open.	No fuel to the engine.	Check the pull-in coil relay. Check the 304 Yel wire for short to battery voltage or open circuit. (See Fuel Supply/Engine Shutoff Circuit Operation .)
Err 70	Hold Coil On	Output from the display is short circuit.	No fuel to the engine.	Check in Hold-in coil. Check the 302 Red wire for short to ground. (See Fuel Supply/Engine Shutoff Circuit Operation .)
Err 71	Hold Coil Off	Output from the display is open.	No fuel to the engine.	Check in Hold-in coil. Check the 302 Red wire for short to battery voltage or open circuit. (See Fuel Supply/Engine Shutoff Circuit Operation .)
Err 72	Starter Relay ON	Output from the Display is short circuit.	Can not crank the engine.	Check the start relay. Check the 518 Gry wire for short to ground. (See Cranking Circuit Operation (NA) .)
Err 73	Starter Relay OFF	Output from the Display is open.	Can not crank the engine.	Check the start relay. Check the 518 Gry wire for short to battery voltage or open circuit. (See Cranking Circuit Operation (NA) .)
Err 74	Display Mode Switch	The LCD Display Mode/Configuration input is stuck on.	No acknowledgement of errors. No other info selectable. No eHydro™ commands selectable.	Test the display mode switch. Check 908 Gry wire and connections. (See Display Mode Switch Circuit Operation .)
Err 75	Invalid VIN	Invalid VIN or VIN has not been programmed.	Display could be programmed with wrong VIN.	Check and update the VIN in both the display and the eHydro™ controller.
Err 76	VIN Type	VIN type does not match the unit type.	Display could be programmed with wrong chassis type.	Update the display to the latest application and configuration data. Update VIN in the display.
Err 77	EOL VIN Type	EOL VIN type does not match the chassis type.	Display could be programmed with wrong chassis type.	Update the display to the latest application and configuration data. Update VIN in the display.
Err 85	Coolant Sensor	Sensor output is short circuit.	Coolant gauge does not work.	Check coolant sensor circuit; Contact your John Deere Dealer.
Err 87	RIO Switch Stuck ON	Reverse implement option switch is stuck on.	No PTO function.	Replace switch.

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Display Panel Tests and Adjustments

Err 88	Bad Intelligent Device or Component	ICC not programmed or programmed incorrectly.	No RIO switch fuction.	Contact John Deere dealer.
Err 89	PTO Solenoid Open Circuit	PTO coil current too low or Open circuit.	PTO solenoid will not function.	Contact John Deere dealer.

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Display Panel Fault Code Chart—Auto HST

Display Value	Description	Cause of Fault	Result of Fault	Required Action
Err 01		NA.		Program the HST controller to the latest Application Software.
Err 02	Forward Pedal	Voltage signal out-of-range or not calibrated.	Machine does not drive.	Adjust sensor within range. Calibrate the sensor. Check the sensor and 686 Lt Blu wire and connections.
Err 03	FNR Lever	Invalid signals are detected.	Machine does not drive.	Check the lever's functionality and wires for short circuit.
Err 04	Engine Speed	No signal at Engine Speed input.	No anti-stall or cruise functions; Loss of performance.	Check the 325A, 325B, and 325C Grn wires and connections for short or open circuit.
Err 05	Brake and Cruise Set/Decel Switch	Cruise control Set/Decel switch depressed while brake is engaged.	No cruise function.	Release brake pedal. Adjust or repair brake switch. Check 247A Pur wire and connections for short or open circuit.
Err 06	MFWD Speed	No signal at MFWD speed input.	No cruise function; Loss of performance.	Test MFWD sensor. Check that MFWD is fully engaged. Check that gear is not in neutral. Check 502 Red wire and connections for short or open circuit.
Err 07	Cruise Set/Decel Switch	Cruise Set/Decel switch is held or stuck on.	No cruise function.	Check 238 Gry and 265 series Grn wires and connections for short circuit to battery voltage. Test the cruise set/decels switch.
Err 08	Throttle Sensor	Voltage signal out-of-range or not calibrated.	No anti-stall function; Loss of performance.	Adjust sensor within range. Calibrate the sensor. Check the sensor and 499A Wht wire and connections.
Err 09	Cruise On/Off and Set Max Speed switches	Cruise and Max Speed inputs are both active	No cruise function	Test the cruise/max speed switch. Check 238 Gry and 267 Pur series wires and connections for short circuit to battery voltage.
Err 10	No application	NA	Machine does not drive.	Program the HST controller with the latest application software.
Err 11	Cruise Set/Decel and Cruise Res/Accel switches	Set/Decel and Resume/Accel switches are both active.	No cruise function.	Test the cruise res/+, set/- switch. Check the 266 Blu and 265 Grn wires and connections for short circuit to battery voltage.
Err 12	Sensor Supply voltage	Voltage is out-of-range.	Machine does not drive.	Check the 673 series of wires and connections for a short or open circuit.
Err 13		NA		Program the HST controller with the latest application software.
Err 14	Pump Current	Coil resistance too high (open) or too low (short).	Machine does not drive.	Test the proportional valve coils. Check 696A Lt Blu and 687 Pur wires and connections for short or open circuit.
Err 15	Operator Present	Operator not in the seat.	Machine does not drive.	Test seat switch. Check 539C, 539B and 539A Wht wires and connections for open circuit.
Err 50	EOL Faults Size	Fault Table size is not compatible with the Application.	Display and HST Error Codes might not be displayed.	Update the display to the latest application and configuration data.

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Display Panel Tests and Adjustments

Display Value	Description	Cause of Fault	Result of Fault	Required Action
Err 51	EOL EEPROM Size	EEPROM Default Parameter table size is not compatible with the Application.	Default configuration settings could be incorrect.	Update the display to the latest application and configuration data.
Err 52	HST Faults Size	HST fault list does not match Display fault list.	HST Error Codes might not displayed.	Update the display to the latest application and configuration data.
Err 53	EOL Major Version	EOL Data structure is incompatible with application.	Loss of performance.	Update the display to the latest application and configuration data.
Err 54	EOL Minor Version	EEPROM Data is updated.	EEPROM Data Level 1 and 2 are reset to EOL Data.	Turn the key switch OFF, wait 3-4 seconds and turn back ON. If error continues, update to the latest software.
Err 55	EEPROM Checksum	EEPROM failure—the values have been reset to defaults, resets the hour meter.	EEPROM Data is reset to EOL Data, Resets the hour meter.	Turn the key switch OFF, wait 3-4 seconds and turn back ON. If error continues, update to the latest software.
Err 56	HST Unable to Send	Critical HST messages are missing.	Loss of features.	Check the communication harness between the display and HST controller. Connectors X5 and X4, wires 924 Yel and 925 Grn wires.
Err 57	HST Timeout	No response from HST controller.	Loss of features.	Check the communication harness between the display and HST controller. Connectors X5 and X4, 924 Yel and 925 series Grn wires.
Err 58	HST Compatibility	HST communication structure is not compatible with Display communication structure.	Loss of features.	Update the display to the latest application and configuration data. If the error continues, update the HST controller with the latest application software.
Err 59	VIN not same	HST VIN does not match the Display VIN.	HST or Display is programmed with wrong VIN.	Check and update the VIN in both the Display and the HST controller.
Err 60	Right Red Lamp ON	Output from the Display is short circuit.	No right turn signal on the ROPS.	Check the right red lamp; check the harness for short circuit to ground.
Err 61	Right Red Lamp OFF	Output from the Display is open.	No right turn signal on the ROPS.	Check the right red lamp; check the harness for short circuit to battery or open circuit.
Err 62	Left Red Lamp ON	Output from the Display is short circuit.	No left turn signal on the ROPS.	Check the left red lamp; check the harness for short circuit to ground.
Err 63	Left Red Lamp OFF	Output from the Display is open.	No left turn signal on the ROPS.	Check the left red lamp; check the harness for short circuit to battery or open circuit.
Err 64	Right Amber Lamp ON	Output from the Display is short circuit.	No right hazard signal on the ROPS.	Check the right hazard light bulb. Check the 135A Grn wire for short to ground. (See Light Circuit Operation .)
Err 65	Right Amber Lamp OFF	Output from the Display is open.	No right hazard signal on the ROPS.	Check the right hazard light bulb. Check the 135A Grn wire for short to battery voltage or open circuit. (See Light Circuit Operation .)

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Display Panel Tests and Adjustments

Display Value	Description	Cause of Fault	Result of Fault	Required Action
Err 66	Left Amber Lamp ON	Output from the Display is short circuit.	No left hazard signal on the ROPS.	Check the left hazard light bulb. Check the 145A Grn wire for short to ground. (See Light Circuit Operation .)
Err 67	Left Amber Lamp OFF	Output from the Display is open.	No left hazard signal on the ROPS.	Check the left hazard light bulb. Check the 145A Grn wire for short to battery voltage or open circuit. (See Light Circuit Operation .)
Err 68	Pull-in Relay ON	Output from the display is short circuit.	No fuel to the engine.	Check the pull-in coil relay. Check the 304A Yel wire for short to ground. (See Fuel Supply/Engine Shutoff Circuit Operation .)
Err 69	Pull-in relay OFF	Output from the display is open.	No fuel to the engine.	Check the pull-in coil relay. Check the 304A Yel wire for short to battery voltage or open circuit. (See Fuel Supply/Engine Shutoff Circuit Operation .)
Err 72	Starter Relay ON	Output from the Display is short circuit.	Can not crank the engine.	Check the start relay. Check the 518A Gry wire for short to ground. (See Cranking Circuit Operation (NA) .)
Err 73	Starter Relay OFF	Output from the Display is open.	Can not crank the engine.	Check the start relay. Check the 518A Gry wire for short to battery voltage or open circuit. (See Cranking Circuit Operation (NA) .)
Err 74	Display Mode Switch	The LCD Display Mode/Configuration input is stuck on.	No acknowledgement of errors. No other info selectable. No HST commands selectable.	Test the display mode switch. Check 908 Gry wire and connections. (See Display Mode Switch Circuit Operation .)
Err 75	Invalid VIN	Invalid VIN or VIN has not been programmed	Display could be programmed with wrong VIN	Check and update the VIN in both the display and the HST controller.
Err 76	VIN Type	VIN type does not match the unit type	Display could be programmed with wrong chassis type	Update the display to the latest application and configuration data. Update VIN in the display.
Err 77	EOL VIN Type	EOL VIN type does not match the chassis type	Display could be programmed with wrong chassis type	Update the display to the latest application and configuration data. Update VIN in the display.

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Display Panel Fault Code Chart MY13—Auto HST

Display Value	Description	Cause of Fault	Result of Fault	Required Action
Err 01		NA.		Program the HST controller to the latest Application Software.
Err 02	Forward Pedal	Voltage signal out-of-range or not calibrated.	Machine does not drive.	Adjust sensor within range. Calibrate the sensor. Check the sensor and 686 Lt Blu wire and connections.
Err 03	FNR Lever	Invalid signals are detected.	Machine does not drive.	Check the lever's functionality and wires for short circuit.
Err 04	Engine Speed	No signal at Engine Speed input.	No anti-stall or cruise functions; Loss of performance.	Check the 325A, 325B, and 325C Grn wires and connections for short or open circuit.
Err 05	Brake and Cruise Set/Decel Switch	Cruise control Set/Decel switch depressed while brake is engaged.	No cruise function.	Release brake pedal. Adjust or repair brake switch. Check 247A Pur wire and connections for short or open circuit.
Err 06	MFWD Speed	No signal at MFWD speed input.	No cruise function; Loss of performance.	Test MFWD sensor. Check that MFWD is fully engaged. Check that gear is not in neutral. Check 502 Red wire and connections for short or open circuit.
Err 07	Cruise Set/Decel Switch	Cruise Set/Decel switch is held or stuck on.	No cruise function.	Check 238 Gry and 265 series Grn wires and connections for short circuit to battery voltage. Test the cruise set/decels switch.
Err 08	Throttle Sensor	Voltage signal out-of-range or not calibrated.	No anti-stall function; Loss of performance.	Adjust sensor within range. Calibrate the sensor. Check the sensor and 499A Wht wire and connections.
Err 09	Cruise On/Off and Set Max Speed switches	Cruise and Max Speed inputs are both active.	No cruise function.	Test the cruise/max speed switch. Check 238 Gry and 267 Pur series wires and connections for short circuit to battery voltage.
Err 10	No application	NA	Machine does not drive.	Program the HST controller with the latest application software.
Err 11	Cruise Set/Decel and Cruise Res/Accel switches	Set/Decel and Resume/Accel switches are both active.	No cruise function.	Test the cruise res/+, set/- switch. Check the 266 Blu and 265 Grn wires and connections for short circuit to battery voltage.
Err 12	Sensor Supply voltage	Voltage is out-of-range.	Machine does not drive.	Check the 673 series of wires and connections for a short or open circuit.
Err 13		NA		Program the HST controller with the latest application software.
Err 14	Pump Current	Coil resistance too high (open) or too low (short).	Machine does not drive.	Test the proportional valve coils. Check 696A Lt Blu and 687 Pur wires and connections for short or open circuit.
Err 15	Operator Present	Operator not in the seat.	Machine does not drive.	Test seat switch. Check 539C, 539B and 539A Wht wires and connections for open circuit.

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Display Panel Tests and Adjustments

Display Value	Description	Cause of Fault	Result of Fault	Required Action
Err 50	EOL Faults Size	Fault Table size is not compatible with the Application.	Display and HST Error Codes might not be displayed.	Update the display to the latest application and configuration data.
Err 51	EOL EEPROM Size	EEPROM Default Parameter table size is not compatible with the Application.	Default configuration settings could be incorrect.	Update the display to the latest application and configuration data.
Err 52	HST Faults Size	HST fault list does not match Display fault list.	HST Error Codes might not be displayed.	Update the display to the latest application and configuration data.
Err 53	EOL Major Version	EOL Data structure is incompatible with application.	Loss of performance.	Update the display to the latest application and configuration data.
Err 54	EOL Minor Version	EEPROM Data is updated.	EEPROM Data Level 1 and 2 are reset to EOL Data.	Turn the key switch OFF, wait 3-4 seconds and turn back ON. If error continues, update to the latest software.
Err 55	EEPROM Checksum	EEPROM failure—the values have been reset to defaults, resets the hour meter.	EEPROM Data is reset to EOL Data, Resets the hour meter.	Turn the key switch OFF, wait 3-4 seconds and turn back ON. If error continues, update to the latest software.
Err 56	HST Unable to Send	Critical HST messages are missing.	Loss of features.	Check the communication harness between the display and HST controller. Connectors X5 and X4, wires 924 Yel and 925 Grn wires.
Err 57	HST Timeout	No response from HST controller.	Loss of features.	Check the communication harness between the display and HST controller. Connectors X5 and X4, 924 Yel and 925 series Grn wires.
Err 58	HST Compatibility	HST communication structure is not compatible with Display communication structure.	Loss of features.	Update the display to the latest application and configuration data. If the error continues, update the HST controller with the latest application software.
Err 59	VIN not same	HST VIN does not match the Display VIN.	HST or Display is programmed with wrong VIN.	Check and update the VIN in both the Display and the HST controller.
Err 60	Right Red Lamp ON	Output from the Display is short circuit.	No right turn signal on the ROPS.	Check the right red lamp; check the harness for short circuit to ground.
Err 61	Right Red Lamp OFF	Output from the Display is open.	No right turn signal on the ROPS.	Check the right red lamp; check the harness for short circuit to battery or open circuit.
Err 62	Left Red Lamp ON	Output from the Display is short circuit.	No left turn signal on the ROPS.	Check the left red lamp; check the harness for short circuit to ground.
Err 63	Left Red Lamp OFF	Output from the Display is open.	No left turn signal on the ROPS.	Check the left red lamp; check the harness for short circuit to battery or open circuit.
Err 64	Right Amber Lamp ON	Output from the Display is short circuit.	No right hazard signal on the ROPS.	Check the right hazard light bulb. Check the 135A Grn wire for short to ground. (See Light Circuit Operation .)

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Display Panel Tests and Adjustments

Display Value	Description	Cause of Fault	Result of Fault	Required Action
Err 65	Right Amber Lamp OFF	Output from the Display is open.	No right hazard signal on the ROPS.	Check the right hazard light bulb. Check the 135A Grn wire for short to battery voltage or open circuit. (See Light Circuit Operation .)
Err 66	Left Amber Lamp ON	Output from the Display is short circuit.	No left hazard signal on the ROPS.	Check the left hazard light bulb. Check the 145A Grn wire for short to ground. (See Light Circuit Operation .)
Err 67	Left Amber Lamp OFF	Output from the Display is open.	No left hazard signal on the ROPS.	Check the left hazard light bulb. Check the 145A Grn wire for short to battery voltage or open circuit. (See Light Circuit Operation .)
Err 68	Pull-in Relay ON	Output from the display is short circuit.	No fuel to the engine.	Check the pull-in coil relay. Check the 304A Yel wire for short to ground. (See Fuel Supply/Engine Shutoff Circuit Operation .)
Err 69	Pull-in relay OFF	Output from the display is open.	No fuel to the engine.	Check the pull-in coil relay. Check the 304A Yel wire for short to battery voltage or open circuit. (See Fuel Supply/Engine Shutoff Circuit Operation .)
Err 70	Hold Coil On	Output from the display is short circuit.	No fuel to the engine.	Check in Hold-in coil. Check the 302 Red wire for short to ground. (See Fuel Supply/Engine Shutoff Circuit Operation .)
Err 71	Hold Coil Off	Output from the display is open	No fuel to the engine	Check in Hold-in coil. Check the 302 Red wire for short to battery voltage or open circuit. (See Fuel Supply/Engine Shutoff Circuit Operation .)
Err 72	Starter Relay ON	Output from the Display is short circuit.	Can not crank the engine.	Check the start relay. Check the 518A Gry wire for short to ground. (See Cranking Circuit Operation (NA) .)
Err 73	Starter Relay OFF	Output from the Display is open.	Can not crank the engine.	Check the start relay. Check the 518A Gry wire for short to battery voltage or open circuit. (See Cranking Circuit Operation (NA) .)
Err 74	Display Mode Switch	The LCD Display Mode/Configuration input is stuck on.	No acknowledgement of errors. No other info selectable. No HST commands selectable.	Test the display mode switch. Check 908 Gry wire and connections. (See Display Mode Switch Circuit Operation .)
Err 75	Invalid VIN	Invalid VIN or VIN has not been programmed.	Display could be programmed with wrong VIN.	Check and update the VIN in both the display and the HST controller.
Err 76	VIN Type	VIN type does not match the unit type.	Display could be programmed with wrong chassis type.	Update the display to the latest application and configuration data. Update VIN in the display.
Err 77	EOL VIN Type	EOL VIN type does not match the chassis type.	Display could be programmed with wrong chassis type.	Update the display to the latest application and configuration data. Update VIN in the display.
Err 85	Coolant Sensor	Sensor output is short circuit.	Coolant gauge does not work.	Check coolant sensor circuit; Contact your John Deere Dealer.
Err 87	RIO Switch Stuck ON	Reverse implement option switch is stuck on.	No PTO function.	Replace switch.

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Display Panel Tests and Adjustments

Display Value	Description	Cause of Fault	Result of Fault	Required Action
Err 88	Bad Intelligent Device or Component	ICC not programmed or programmed incorrectly.	No RIO switch fuction.	Contact John Deere dealer.
Err 89	PTO Solenoid Open Circuit	PTO coil current too low or Open circuit.	PTO solenoid will not function.	Contact John Deere dealer.

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Configure the Display

Reason:

To set the display operation to match the machine and the options and equipment installed.

Equipment:

- Functioning machine with a fully charged battery.

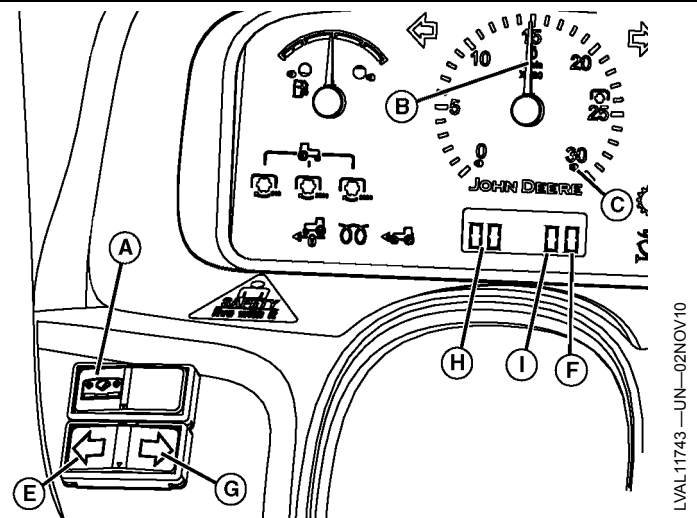
Procedure:

The following steps are used to read or modify the configuration parameters:

1. Ensure the key switch is in the OFF position.
2. Press and hold the display mode switch (A) while performing the next step.
3. Turn the key switch to the ON position and release the display mode switch before the engine speed gauge needle (B) hits the right peg (C).

The display should read "00 00".

4. To access the first address of the non-volatile read/write memory, the access level one code, "0A", must be entered by performing the following:
 - a. Actuate the left turn signal (E) to select the ones digit field (F). When selected, the ones data field will be flashing.
 - b. Actuate the right turn signal (G) input until the ones digit field (F) changes to the letter "A".
5. Actuate the left turn signal to select the address data field (H). Both digits of the address data field should be flashing. The display panel is now in the non-volatile read/write memory access level. If the access level one value is incorrect, the address value will roll back to "00 00". If the access level one value is correct, the address value will increment to the next address.
6. With the address data field flashing, actuate the right turn signal (G) input. The data field will indicate the value at this new address.



- A—Display Mode Switch
 B—Engine Speed Gauge Needle
 C—Right Peg (engine speed gauge)
 E—Left Turn Signal
 F—Ones Digit Field
 G—Right Turn Signal
 H—Address Data Field
 I—Tens Digit Field

7. To edit the value at this address, actuate the left turn signal (E) to select the ones digit field (F). When selected the ones data field will be flashing.
8. Actuate the right turn signal (G) input to change the ones digit field (F) to the desired value.
9. Actuate the left turn signal (E) to select the tens digit field (I). When selected the tens data field will be flashing.
10. Actuate the right turn signal (G) input to change the tens digit field (I) to the desired value.
11. Actuate the left turn signal (E) to move to the address data field (H). When the address data field is active, actuate the right turn signal (G) until the desired address is selected.
12. The following table is a list of the available configuration settings for the display panel.

Address	Configuration Parameter	Configuration Value
00 xx	Access Level One.	Value = 00 0A
01 xx	Ground Speed Units Select.	Default = MPH Value in ones place: <ul style="list-style-type: none"> • If even = MPH • If odd = km/h
02 xx and 03 xx	Base Tire Size. (See Editing Tire Size Value in Section 40, Group 45.)	Default value = 2972 The default code will read, 02 29 and 03 72
04 xx	LoadMatch™ /MotionMatch™ Option. eHydro™ only.	Tens place = Load Match switch Ones place = Motion Match Value 0 = No switch installed Value 1 = Switch installed
05 xx	Wheel Speed Enable. eHydro™/Auto HST only.	Value 00 = Disabled Value 01 = Enabled

Continued on next page

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Address	Configuration Parameter	Configuration Value
06 xx	Model Selection.	For S.N. —599999 <ul style="list-style-type: none"> • Value 00 = New Unit • Value 02 = HST For S.N. 600000— <ul style="list-style-type: none"> • Tens place = Tractor Type <ul style="list-style-type: none"> - Value 0 = Open Station - Value 1 = Cab • Ones place = Transmission Type <ul style="list-style-type: none"> - Value 1 = PRT - Value 2 = eHydro™ - Value 3 = Auto HST Example: An eHydro™ tractor with cab would be configured 06 12
07 xx	Available for future use.	None

13. To save the last changed data, always move to the next address data field before turning the key switch off.

14. For example: If a motion match switch is added, make the changes to address data field 04, then move to next address 05 and turn key switch off.

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15. To exit the configuration setup mode, turn the machine key switch to the OFF position. Configuration setup may be exited at any time. The display memory will store the last settings for each address when the key switch is turned to the OFF position.

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Editing Tire Size Value

Reason:

To configure the display logic to match the circumference of the tires installed.

Equipment:

- Measuring device to measure up to 50 meters accurately.
- Functioning machine with a fully charged battery.
- At least 50m (54.68 yd) of open space to drive the machine in a straight line.

Procedure:

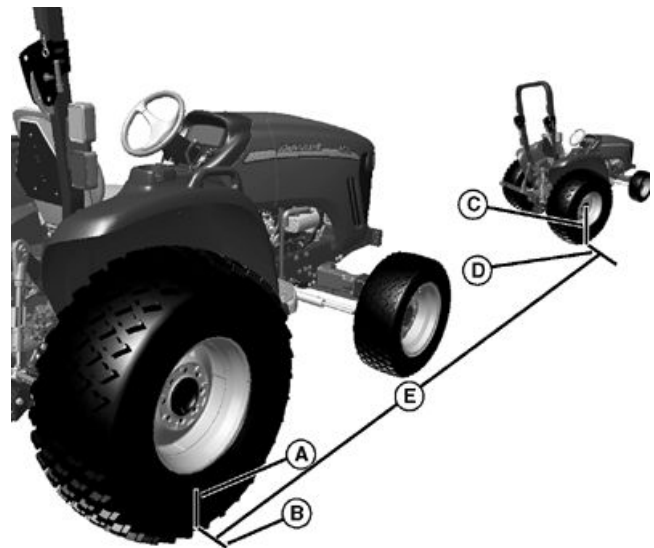
The following steps are used to read or modify the configuration parameters for the circumference of the rear tires.

1. Read and be familiar with the Configure the Display procedure. (See [Configure the Display](#).)

NOTE: The default tire size value is 2972 mm. This procedure will use the default value in all the examples. The actual value for the tires installed on the machine may vary.

The tire size configuration value is measured and entered in millimeters.

2. Set rear tire pressure to specification for the type of tire installed on the machine. Be sure to use an accurate low pressure gauge. Be aware that no two tires will have the exact same circumference at the same air pressure—this is normal. Ordering new tires will not correct this situation.
3. Move machine to an open, flat level surface at least 50m (54.68 yd) long to drive the machine in a straight line.
4. Stop engine and lock park brake.
5. Mark the tire at the center of the point where it contacts the ground (A). Mark the ground at this same point (B).
6. Start the engine and drive the machine slowly forward until the rear tire completes 10 revolutions and the tire mark is centered on the ground again (C).



A—Tire Center Point Of Ground Contact
B—Start Ground Mark
C—10 Revolutions And The Tire
D—End Ground Mark
E—Distance Of Travel

7. Stop engine and lock park brake.
8. Mark the ground at the new tire center point (D).
9. Measure the distance (E) between the two ground points (B and D). Divide this measurement by 10. This number is the circumference of the rear tires. The default value is 2972 mm.
10. The tire size value is entered in millimeters in two address locations. The first two digits (29) will be entered in the 02 xx address and the second two digits (72) will be entered in the 03 xx address. (See [Configure the Display](#).) for specific instructions to access the proper data fields.

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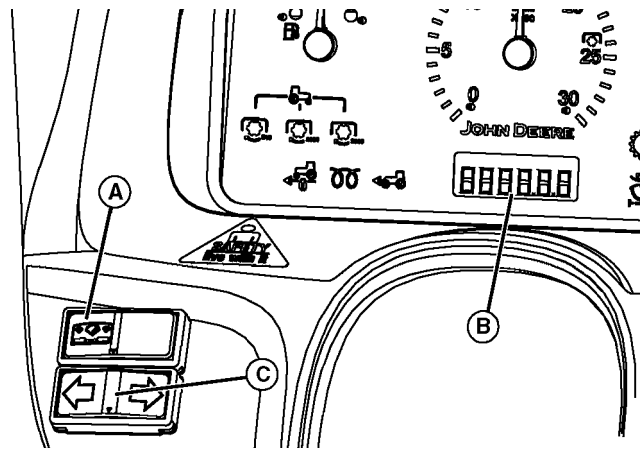
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Editing Motion Match Settings—eHydro™/Auto HST

Option 1 (without switch)

With no motion match switch installed, or configured into the drive controller, the drive controller only has one rollout setting available.

1. Turn the key switch to ON position.
2. Make sure that no error codes are displayed. If any errors are displayed, momentarily activate the display mode switch (A) to acknowledge the error.
3. Press and hold the display mode switch (A) until "rELEAS" is displayed in the LCD (B).
4. The last edited command will display, either Coast or Load.
5. If Coast is not displayed, use left or right turn signals to select the Coast command.
6. Momentarily activate the display mode switch (A) to edit the roll out settings.
7. The LCD (B) will display the last setting of 1-4, def (5), or 6-9. The factory setting (default) is def (5). The rollout length increases by percentage where 1 is the shortest rollout, 9 is the longest rollout, and def (5) is the default.
8. Activate the left or right turn signals (C) to increase or decrease the roll out setting.
9. When the desired setting is displayed, momentarily activate the display mode switch to store the setting.
10. The LCD (B) will change to the word busy' for about 1 second and then change to the normal mode.



A—Display Mode Switch
B—LCD

C—Turn Signals

LVAL11745—UN—02NOV10

Option 2 (with switch)

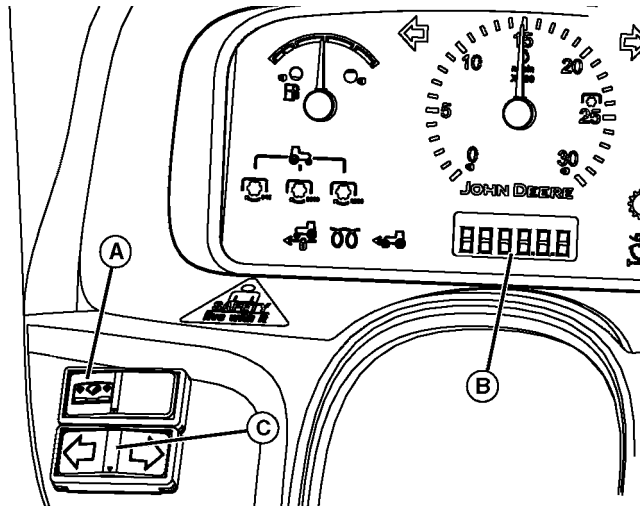
With the motion match switch installed and configured into the display, the rollout will have a long and a short rollout setting automatically available. The default for both the long and short rollout is 5. If the motion match switch is installed but not configured, the rollout will be the same when the motion match switch is on or off.

1. Verify that the display has been configured to recognize the motion match switch as being installed. (See [Configure the Display.](#)) Code 04 x 01.
2. Turn the key switch to ON position.

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3. Make sure that no error codes are displayed. If any errors are displayed, momentarily activate the display mode switch (A) to acknowledge the error.
4. Press and hold the display mode switch (A) until "rELEAS" is displayed in the LCD (B).
5. The last edited command will display, either Coast or Load.
6. If Coast is not displayed, use left or right turn signals to select the Coast command.
7. Momentarily activate the display mode switch (A) to edit the roll out settings.
8. Activate the left or right turn signals (C) to increase or decrease the roll out setting.
9. When the desired setting is displayed, momentarily activate the display mode switch to store the setting.
10. Select the desired settings between 6 thru 9 and momentarily activate the Display Mode Switch. Where 6 being the shortest of the long rollout, and 9 being the longest of the long rollout and 5 being the default. The value of 5 is displayed as Long_d'.
11. Select the desired settings between 1 thru 4 and momentarily activate the Display Mode Switch to finish the setting. Where 1 being the shortest of the short



A—Display Mode Switch
B—LCD
C—Turn Signals

rollout, and 4 being the longest of the short rollout and 5 being the default. Value of 5 is displayed as Shrt_d'.

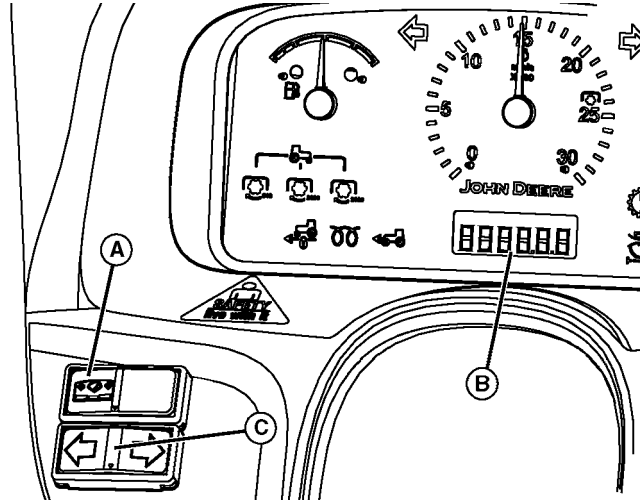
12. The LCD (B) will change to the word busy for about 1 second and then change to the normal mode.

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Editing Load Match Settings—eHydro™

Option 1 (without switch):

1. Turn the key switch to ON position.
2. Make sure that no error codes are displayed. If any errors are displayed, momentarily activate the display mode switch (A) to acknowledge the error.
3. Press and hold the display mode switch (A) until "rELEAS" is displayed in the LCD (B).
4. The last edited command will display, either Coast or Load.
5. If Load is not displayed, use left or right turn signals to select the Load command.
6. Momentarily activate the display mode switch (A) to edit the load match setting.
7. The LCD (B) will display the last setting for the load match function, either on or off.
8. Activate the left or right turn signals (C) to turn the load match on or off.
9. When the desired setting is displayed, momentarily activate the display mode switch (A) to store the setting.



A—Display Mode Switch
B—LCD
C—Turn Signals

10. The LCD (B) will change to the word busy for about 1 second and then change to the normal mode.

Option 2 (with switch):

No editing is available.

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Entering Diagnostic and Calibration Modes

1. Turn the key switch to ON position.
2. Make sure that no error codes are displayed. If any errors are displayed, momentarily activate the display mode switch (A) to acknowledge the error.

NOTE: Once the display mode switch is depressed, the password must be started to be entered within 2 seconds. The password must be completed within 30 seconds of starting.

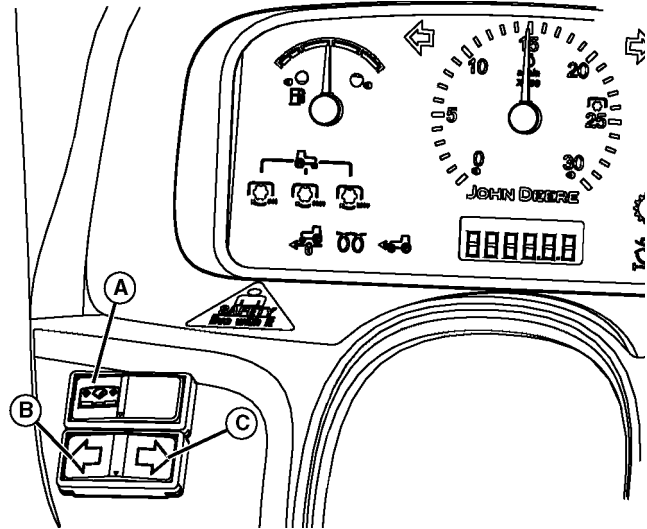
If the password is wrong for 3 times, you can not enter the password until after 1 hour of machine operation.

3. Press and hold the display mode switch (A). Within 2 seconds, start entering the password using Left (B) and Right (C) turn signal switch and then release the display mode switch to enter into any of the diagnostic modes as listed below.
4. Press and hold the display mode switch for 2 seconds or turn the key switch to OFF position to exit any of the modes.

Diagnostic Mode 1:

NOTE: The password is different for each diagnostic mode. R = Right and L = Left on the turn signal switch.

1. Enter password, RLLRLR. Use this password to get the information that is within the Display controller.
2. This mode Display's software version number, VIN (vehicle identification number) and error codes including occurrence counter that have occurred in the current power cycle are displayed. No error codes are stored from previous power cycles.
3. Use left (B) or right (C) turn signal switch to navigate through the information.
4. As each possible error is displayed. The display format for each error code will appear as XX.XX.X, where the first two digits indicate the error code, the second two digits indicate the number of times this error has occurred, and the third signal digit indicates if the error is active "1" or inactive "0".



A—Display Mode Switch
B—Left Turn Signal

C—Right Turn Signal

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Diagnostic Mode 2 (eHydro™/Auto HST):

NOTE: The password is different for each access mode. R = Right and L = Left on the turn signal switch.

1. Enter password, LRRRLR. Use this password to get the information that is within the eHydro™/Auto HST controller.
2. In this mode, Display controller communicates with the eHydro™ controller to get the parameters as listed in the following table.

NOTE: The diagnostic values are displayed live. The values displayed will change (after refreshing the display by cycling the display to the next higher or lower address and then returning to the original address) if the components for the item selected are changed. Example, when the forward pedal voltage (No. 17) is displayed, if the forward pedal is pressed, the voltage reading on the display will also change (after cycling).

3. Use left (B) or right (C) turn signal switch to navigate through the parameters.

Diagnostic Mode 2 Parameter Table (eHydro™)

No.	Display Format	Description
1	SIDXXX	Software ID where XXX is a number representing a part of software part number like "426".
2	SfTX.XX	Software Version where X.XX is a number representing a software version like "5.60".
3	FCH_X.X	Forward pedal high calibrated voltage where X.X is the voltage.
4	FCL_X.X	Forward pedal low calibrated voltage where X.X is the voltage.
5	rCH_X.X	Rear pedal high calibrated voltage where X.X is the voltage.
6	rCL_X.X	Rear pedal low calibrated voltage where X.X is the voltage.
7	tCH_X.X	Throttle sensor high calibrated voltage where X.X is the voltage.
8	tCL_X.X	Throttle sensor low calibrated voltage where X.X is the voltage.
9	FtHXXX	Forward valve threshold current where XXX in mA with decimal truncated.

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Diagnostic Mode 2 Parameter Table (eHydro™)

No.	Display Format	Description
10	rHXXX	Reverse valve threshold current where XXX in mA with decimal truncated.
11	gSXXXX	Ground speed where XXXX is frequency (filtered).
12	Cr_XXX	Cruise on or off where XXX is either _On or OFF.
13	rESXXX	Cruise resume/accel where XXX is either _On or OFF.
14	Br_XXX	Brake on or off where XXX is either _On or OFF.
15	SEtXXX	Cruise set/decel where XXX is either _On or OFF.
16	SSPXXX	Set max speed where XXX is either _On or OFF.
17	FP__X.X	Forward pedal voltage where X.X is the voltage.
18	rP__X.X	Rear pedal voltage where X.X is the voltage.
19	OPSXXX	Operator present (seat switch) on or off where XXX is either _On or OFF.
20	AgrOPX	Motion Match (aggressiveness) Option where X is 1 or 2.
21	AgrXXX	Motion Match where XXX is _On or OFF or _nA. If motion match option is 1, _nA' shall be displayed.
22	Agr1XX	Motion Match Short Rollout/Option1 values XX where the first X is 1 to 5 and the second X is 1 to 9.
23	Agr2XX	Motion Match Long Rollout values where XX is 5 to 9 or nA'. If motion match option is 1, nA' shall be displayed.
24	tP__X.X	Throttle position voltage where X.X is the voltage.
25	AStXXX	Anti-stall (load match) on or off where XXX is either _On or OFF.
26	ESXXXX	Engine speed where XXXX is frequency (filtered).
27	PCPXXX	Pedal command percent where XXX is in percentage.
28	SPCXXX	Max speed command percent where XXX is in percentage.
29	StCXXX	State command percent where XXX is in percentage.
30	ASCXXX	Anti-stall (load match) percent where XXX is in percentage.
31	FCPXXX	Final command percent where XXX is in percentage.
32	PCXXXX	Pump current where XXXX is in mA.
33	CrLXXX	Cruise lamp output on or off where XXX is either _On or OFF.
34	BA_XXX	Back up alarm output on or off where XXX is either _On or OFF.
35	nESXXX	Neutral state output where XXX is either _On or OFF.
36	FL_XXX	Fault lamp output on or off where XXX is either _On or OFF.
37	FS_XXX	Frame size input where XXX is either _On or OFF.
38	CCrXX.X	Calculated coil resistance where XX.X is in Ohms.
39	YY_XXX	Error Codes, where YY is error code number and XXX is occurrence count.
40	CLR_X?	Clear error codes, where X is Y'es or N'o.

Diagnostic Mode 2 Parameter Table (Auto HST)

No.	Display Format	Description
1	SIDXXX	Software ID where XXX is a number representing a part of software part number like "426".
2	SFtX.XX	Software Version where X.XX is a number representing a software version like "5.60".
3	FCH_X.X	Forward pedal high calibrated voltage where X.X is the voltage.
4	FCL_X.X	Forward pedal low calibrated voltage where X.X is the voltage.
5	tCH_X.X	Throttle sensor high calibrated voltage where X.X is the voltage.
6	tCL_X.X	Throttle sensor low calibrated voltage where X.X is the voltage.
7	FtHXXX	Forward valve threshold current where XXX in mA with decimal truncated.
8	rHXXX	Reverse valve threshold current where XXX in mA with decimal truncated.
9	gSXXXX	Ground speed where XXXX is frequency (filtered).
10	Cr_XXX	Cruise on or off where XXX is either _On or OFF.
11	rESXXX	Cruise resume/accel where XXX is either _On or OFF.
12	Br_XXX	Brake on or off where XXX is either _On or OFF.
13	SEtXXX	Cruise set/decel where XXX is either _On or OFF.
14	SSPXXX	Set max speed where XXX is either _On or OFF.
15	FP__X.X	Forward pedal voltage where X.X is the voltage.
16	FNrXXX	FNR switch position where XXX is FWD, NTL or REV.
17	OPSXXX	Operator present (seat switch) on or off where XXX is either _On or OFF.

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18	AgrOPX	Motion Match (aggressiveness) Option where X is 1 or 2.
19	AgrXXX	Motion Match where XXX is _On or OFF or _nA. If motion match option is 1, _nA' shall be displayed.
20	Agr1XX	Motion Match Short Rollout/Option1 values XX where the first X is 1 to 5 and the second X is 1 to 9.
21	Agr2XX	Motion Match Long Rollout values where XX is 5 to 9 or nA'. If motion match option is 1, nA' shall be displayed.
22	tP__X.X	Throttle position voltage where X.X is the voltage.
23	AStXXX	Anti-stall (load match) on or off where XXX is either _On or OFF.
24	ESXXXX	Engine speed where XXXX is frequency (filtered).
25	PCPXXX	Pedal command percent where XXX is in percentage.
26	SPCXXX	Max speed command percent where XXX is in percentage.
27	StCXXX	State command percent where XXX is in percentage.
28	ASCXXX	Anti-stall (load match) percent where XXX is in percentage.
29	FCPXXX	Final command percent where XXX is in percentage.
30	PCXXXX	Pump current where XXXX is in mA.
31	CrLXXX	Cruise lamp output on or off where XXX is either _On or OFF.
32	BA_XXX	Back up alarm output on or off where XXX is either _On or OFF.
33	nESXXX	Neutral state output where XXX is either _On or OFF.
34	FL_XXX	Fault lamp output on or off where XXX is either _On or OFF.
35	CCRXX.X	Calculated coil resistance where XX.X is in Ohms.
36	SHNXXX	FNR shifter Neutral switch, where XXX is _On or OFF.
37	SHFXXX	FNR shifter Forward switch, where XXX is _On or OFF.
38	SHRXXX	FNR shifter Reverse switch, where XXX is _On or OFF.
39	YY_XXX	Error Codes, where YY is error code number and XXX is occurrence count.
40	CLR_X?	Clear error codes, where X is Y'es or N'o.

Diagnostic Mode 3—System Calibration (eHydro™ only):

*NOTE: The password is different for each access mode.
R = Right and L = Left on the turn signal switch.*

The system calibration routine provides for the required machine set-up to factory specifications. It leads step by

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step through the calibration process of the inputs from the forward/drive pedal sensor, reverse pedal sensor (eHydro™ only), and throttle sensor, as well as the forward and reverse coil outputs. The system calibration mode is used to match the sensors and coils to the electronic drive controller. (See eHydro™—Electronic Drive Controller System Calibration.)

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eHydro™—Electronic Drive Controller System Calibration

Reason:

To calibrate the electronic drive controller when the following conditions exist:

- Valve error code is present
- Transmission drive coil has been changed
- Electronic drive controller has been changed

Test Conditions:

- Machine on jack stands
- Operator on seat
- Range transmission in A position
- Park brake unlocked
- MFWD disengaged
- Engine running at low idle
- Max speed/cruise switch off
- Motion match switch in short rollout position

Procedure:

1. Verify that both the high and low engine rpm are set to specification before starting calibration.

CAUTION: Avoid Injury! The wheels will spin during the calibration process. Be certain that all four wheels are safely supported by jack stands and that all other persons and objects are clear of the wheels.

NOTE: Be sure the wheels can spin freely as the calibration process cannot detect any resistance that may be present. This will result in faulty calibration results.

2. Place the machine on jack stands and unlock park brake.
3. With an operator on the seat, set the range transmission to gear range A, and disengage the MFWD.
4. Place the load match switch in the off position.
5. Place the cruise control switch in the off position and the motion match (if installed) switch in the short rollout position.
6. Start and run the engine at low idle. The engine has to run during the entire calibration routine.

NOTE: The password is different for each access mode. R = Right and L = Left on the turn signal switch.

7. Enter password, LLLRLR to enter the eHydro™ controller into calibration mode.

8. "Cal OFF" is displayed. When "Cal OFF" is displayed, momentarily pressing the display mode switch will cancel the calibration mode.
9. Use left or right turn signal switch to change the display info to "Cal ON".
10. When "CalON" is displayed, momentarily press display mode switch.
11. The following info will be displayed prompting for action from the operator. In case of an error while calibrating, "Err" is displayed.

Display Info	Description
BuSy	Waiting or Unknown
FPEDAL	Forward Foot Pedal Sensor
RPEDAL	Reverse Foot Pedal Sensor
ThrOtL	Throttle Position Sensor
F_COIL	Forward Valve Coil
R_COIL	Reverse Valve Coil
DonE	Done

Diagnostic Mode 3 Calibration Table:

12. The LCD display will display which sensor has to be calibrated next, beginning with the one for the forward pedal. As soon as a sensor is calibrated properly the corresponding code will disappear and the next code in the calibration sequence will be displayed. The word "BuSy" will be displayed while the drive controller is writing the calibration information to memory.
13. When the LCD display reads "FPEDAL", press and hold the forward pedal to the full speed position.
14. When the LCD display changes to read "RPEDAL", release the forward pedal to the neutral position and wait 3—4 seconds, then press and hold the reverse pedal to the full speed position.
15. When the LCD display changes to read "ThrOtL", release the reverse pedal to the neutral position and wait 1—2 seconds, then move the throttle lever to the high idle position.
16. When the LCD display changes to read "F_COIL", press and hold the forward pedal to the full speed position.
17. When the LCD display changes to read "R_COIL", release the forward pedal to the neutral position and wait 3—4 seconds, then press and hold the reverse pedal to the full speed position.
18. When the LCD display changes to read "BuSy", release the reverse pedal.
19. When the calibration process has been successfully completed, the word "DonE" is displayed for about 2 seconds to finish calibration. Then the display will change to the normal display mode.

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Auto HST—Electronic Drive Controller System Calibration

Reason

To calibrate the electronic drive controller when the following conditions exist:

- Valve error code is present
- Transmission drive coil has been changed
- Electronic drive controller has been changed
- Anytime the hydrostatic unit has been replaced

Test Conditions

- Machine on jack stands with all four wheels off of the ground
- Operator on seat
- Range transmission in A position
- Park brake unlocked
- MFWD disengaged
- FNR in neutral position.
- Engine running at low idle
- Max speed/cruise switch off
- Motion match switch in short rollout position

Procedure

1. Verify that both the high and low engine rpm are set to specification before starting calibration.
2. Disconnect drive pedal throttle cable. (See [Throttle Cable Replacement/Adjustment \(Auto HST\)](#).)

CAUTION: Avoid Injury! The wheels will spin during the calibration process. Be certain that all four wheels are safely supported by jack stands and that all other persons and objects are clear of the wheels.

NOTE: Be sure the wheels can spin freely as the calibration process cannot detect any resistance that may be present. This will result in faulty calibration results.

3. Place the machine on jack stands and unlock park brake.
4. Place FNR lever in neutral position.
5. With an operator on the seat, set the range transmission to gear range A, and disengage the MFWD.
6. Place the cruise control switch in the off position and the motion match (if installed) switch in the short rollout position.
7. Start and run the engine at low idle. The engine has to run during the entire calibration routine.

NOTE: The password is different for each access mode. R = Right and L = Left on the turn signal switch.

8. Enter password, LLLRLR to enter the Auto HST controller into calibration mode.

9. Release the display mode switch.
10. "Cal OFF" is displayed. When "Cal OFF" is displayed, momentarily pressing the display mode switch will cancel the calibration mode.
11. Use left or right turn signal switch to change the display info to "CalON".
12. When "CalON" is displayed, momentarily press display mode switch.
13. The following info will be displayed in sequence prompting for action from the operator. In case of an error while calibrating, "Err" is displayed.

Display Info	Description
BuSy	Waiting or Unknown
FPEDAL	Drive Foot Pedal Sensor (forward)
FNR	Forward/Neutral/Reverse Switch (forward, neutral, reverse)
ThrOtL	Throttle Position Sensor
F_COIL	Forward Valve Coil
R_COIL	Reverse Valve Coil
DonE	Done

Diagnostic Mode 3 Calibration Table

14. The LCD display will display which sensor has to be calibrated next, beginning with the one for the drive pedal. As soon as a sensor is calibrated properly the corresponding code will disappear and the next code in the calibration sequence will be displayed. The word "BuSy" will be displayed while the drive controller is writing the calibration information to memory.
 15. When the LCD display reads "FPEDAL", press and hold the forward pedal to the full speed position.
 16. When the LCD display changes to read "FNR", release the drive pedal and place the FNR switch into the forward position and wait 5 seconds, then place the FNR lever in the neutral position. Wait 5 seconds and place the FNR switch in the reverse position. Wait 5 seconds and return the FNR lever to the neutral position.
 17. When the LCD display changes to read "ThrOtL", move the throttle lever to the high idle position. Wait until the display shows "F_COIL". Leave at high idle for the rest of the procedure.
 18. Place the FNR lever in the forward position.
 19. Press and hold the drive pedal to the full speed position.
- NOTE: The forward and reverse coils may take as long as 25 seconds each to calibrate.*
20. When the LCD display changes to read "R_COIL", release the drive pedal to and wait 5 seconds, Place the FNR lever in the neutral position and wait 5 seconds. Place the FNR lever in the reverse position. Press and hold the drive pedal to the full speed position.

Continued on next page

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21. When the LCD display changes to read "BuSy", release the drive pedal.
22. When the calibration process has been successfully completed, the word "DonE" is displayed for about 2 seconds to finish calibration. Then the display will change to the normal display mode.
23. Place the FNR lever in the neutral position.
24. Return throttle to low idle position and turn key switch to off.
25. Reconnect drive pedal throttle cable. (See [Throttle Cable Replacement/Adjustment \(Auto HST\).](#))
26. Check for proper drive function.

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eHydro™/Auto HST—Single Sensor Calibration

Reason:

To calibrate the electronic drive controller to a sensor if a single sensor (throttle position sensor, forward pedal sensor, or reverse pedal sensor (eHydro™ only) has been adjusted or replaced.

NOTE: Although the intent is to calibrate one sensor, all listed sensors will have to be cycled through their complete range of motion to properly complete this procedure.

Test Conditions:

- Operator on seat
- Park brake locked
- Range transmission in neutral
- Key switch in the run position, engine not running
- MFWD disengaged
- Max speed/cruise switch off
- Motion match switch in short rollout position (if installed)
- FNR lever in neutral position (Auto HST only)

Procedure:

1. Verify that both the high and low engine rpm are set to specification before starting calibration.
2. Disconnect all sensors for 10 seconds.
 - Throttle position sensor
 - Forward/drive pedal sensor
 - Reverse pedal sensor (eHydro™ only)
3. Reconnect all sensors.

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4. With an operator on the seat, place the range transmission in neutral, and disengage the MFWD.
5. Place the load match (eHydro™ only) and cruise control switch in the off position and the motion match switch (if installed) in the short rollout position.
6. Verify the throttle lever is in the low idle position and the drive pedal(s) are released.
7. Turn the key switch to the run position.
8. Wait 3—4 seconds, then move the control to be calibrated to the extreme opposite position and wait 3-4 seconds.
 - Throttle lever to the high idle position
 - Forward/drive pedal to the full speed position
 - Reverse pedal to the full speed position (eHydro™ only)
9. Move the control being calibrated back to the original position. Repeat this procedure for all remaining sensors regardless if it was the sensor being calibrated or not.
 - Throttle lever to the low idle position
 - Forward/drive pedal to the released position
 - Reverse pedal to the released position (eHydro™ only)
10. Wait 1—2 seconds before turning the key to off or starting the engine.
11. If the sensor does not calibrate or there are two or more sensors to calibrate, (See [eHydro™—Electronic Drive Controller System Calibration.](#)) or (see [Auto HST—Electronic Drive Controller System Calibration.](#))

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Test Kit

Function:

An alternate method to test and set the voltage readings on the sensors.

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on eHydro™/Auto HST models. (See Entering Diagnostic and Calibration Modes in Section 40, Group 45.), and see Diagnostic Mode 2 (eHydro™/Auto HST). The diagnostic mode will provide a reading of current drive component operating values such as voltage, current, or frequency.

Equipment:

- JDG1575 Test Kit

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Theory:

The test kit is intended to be used to adjust and diagnose the operational components used to engage and control the hydrostatic transmission.

With the proper adapter harnesses connected to connector box, the following components can be tested and/or adjusted:

- Throttle position sensor, test for voltage,
- Forward/Drive pedal position sensor, test for voltage,
- eHydro™ only—Reverse pedal position sensor, test for voltage (eHydro™ only), and
- MFWD speed sensor, test for frequency.

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eHydro™/Auto HST—Throttle Position Sensor Test and Adjustment

Purpose:

The throttle position sensor is tested based upon the proper voltage input and output with the throttle in the slow idle and fast idle positions.

The display panel (Diagnostic mode 2, preferred method) or the test kit (JDG1575, optional method) or Service ADVISOR™ (optional method) can be used to test the throttle position sensor.

Procedure—Diagnostic Mode 2:

Test Conditions:

- Key switch in run position, engine not running.
 - Throttle against stop in slow idle position.
 - Drive pedal(s) in released position.
 - Park brake locked.
1. Verify engine speed is set within specification. (See Slow Idle Adjustment in Section 03, Group 05.) in the Engine section.
 2. Park machine safely and set to test conditions.
 3. Enter the diagnostic mode 2. (See Entering Diagnostic and Calibration Modes in Section 40, Group 45.) and see Diagnostic Mode 2 (eHydro™/Auto HST).
 4. Toggle the right turn signal switch to display position 24 (tP__X.X) for throttle position (eHydro™) or display position 22 (tP__X.X) for throttle position (Auto HST).
 5. Verify the throttle lever is in the slow idle position and note the voltage on the display panel.
 6. Move the throttle lever to the high idle position and note the voltage on the display panel.
 7. If the voltage readings are not within specification, adjust the throttle position sensor to specifications.

Throttle Position Sensor—Specification

Input—Voltage.....	5.0 ± 0.2 V
Slow Idle Position	
Signal—Voltage.....	0.7—0.9 V
Fast Idle Position	
Signal—Voltage.....	2.0—3.7 V
	greater than slow idle signal voltage

Lock Nut—Torque..... 5 N·m (44 lb-in)

Procedure—Test Kit:

Test Equipment:

- JDG1575 Test Kit

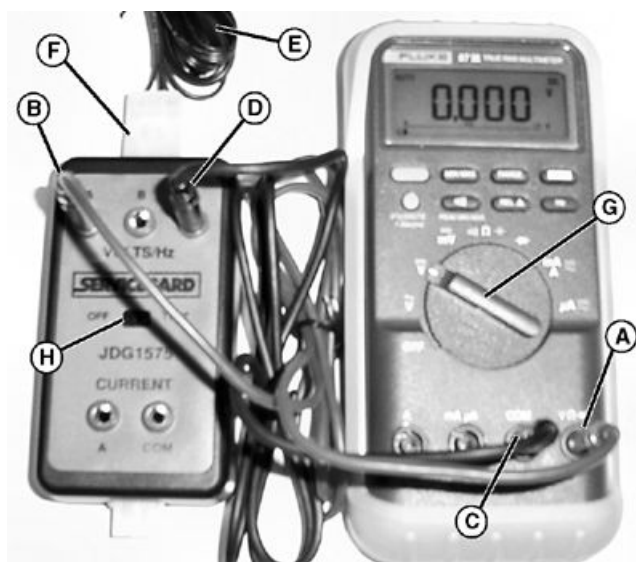
Test Conditions:

- Key switch in run position, engine not running.
- Throttle against stop in slow idle position.
- Drive pedal(s) in released position.
- Park brake locked.
- Position sensor adapter connected to throttle position sensor and 3-pin extender harness.
- Red lead connected to multimeter and connector box.
- Black lead connected to multimeter and connector box.

1. Verify engine speed is set within specification. (See Slow Idle Adjustment in Section 03, Group 05.) in the Engine section.

NOTE: Make sure key switch is OFF when disconnecting sensor. If key switch is in run position and sensor connector is disconnected for longer than 3 seconds, the sensor will have to be calibrated. (See eHydro™/Auto HST—Single Sensor Calibration in Section 40, Group 45.), (See eHydro™—Electronic Drive Controller System Calibration in Section 40, Group 45.), or Auto HST—Electronic Drive Controller System Calibration in Section 40, Group 45.)

2. Park machine safely and set to test conditions.
3. Connect the red lead to the Volt, Ohms, Hz input jack (A) of the multimeter and the voltage A terminal (B) of the connector box.
4. Connect the black lead to the COM input jack (C) of the multimeter and the voltage C terminal (D) of the connector box.
5. Connect the 3-pin extender harness (E) into the 3-pin connector (F) of the connector box.
6. Set the multimeter selector (G) to the DCV position.
7. Set breakout box switch to off position (H).



A—HZ Input Jack
B—Voltage A Terminal
C—COM Input Jack
D—Voltage C Terminal

E—3-Pin Extender Harness
F—3-Pin Connector
G—Multimeter Selector
H—Off Position

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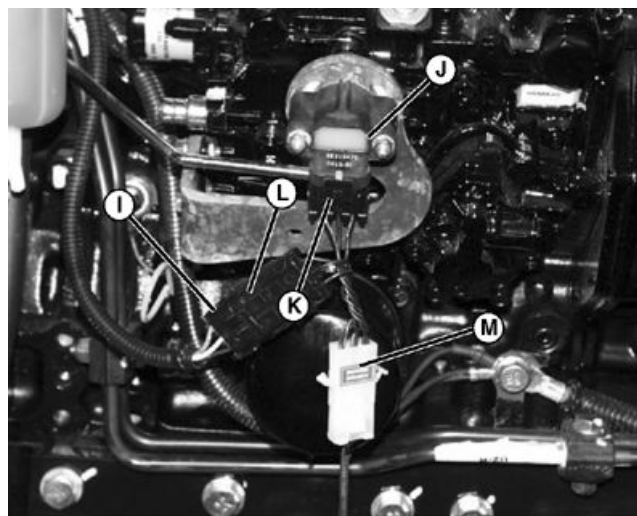
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8. Disconnect the machine wiring harness (I) from the throttle position sensor (J).
9. Connect the male connector (K) of the position sensor adaptor into the throttle position sensor (J) and the female connector (L) into the machine wiring harness (I).
10. Plug the connector (M) into the extender harness.
11. Turn the key switch to the run position.
12. The voltage reading (input voltage) across the A and C terminals of the connector box should be at specification. If not, test the power circuit. (See [Power Circuit Operation](#) in Section 40, Group 35.)

I— Machine Wiring Harness
J— Throttle Position Sensor
K—Male Connector

L—Female Connector
M—Connector



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13. Move the red lead on the connector box from the A terminal (B) to the B terminal (N).

NOTE: If the sensor needs to be replaced or adjusted, perform the sensor calibration. (See eHydro™—Electronic Drive Controller System Calibration in Section 40, Group 45.) or Auto HST—Electronic Drive Controller System Calibration in Section 40, Group 45.)

14. The voltage reading (slow idle position signal voltage) across the B and C terminals of the connector box should be to specification. If not, adjust the throttle position sensor to specification.

15. Move the throttle lever to the fast idle position. The voltage reading (fast idle position signal voltage) across the B and C terminals of the connector box should be to specification. If not, adjust the throttle position sensor to specification.

NOTE: Make sure key switch is in OFF position when disconnecting sensor. If key switch is in RUN position and sensor connector is disconnected for longer than 3 seconds, the sensor will have to be manually calibrated.

16. Turn the key switch to the OFF position.

17. Disconnect the position sensor adapter harness from the machine wiring harness and the position sensor. Connect the machine wiring harness to the position sensor.

Throttle Sensor Adjustment:

1. If the voltage reading is not within specification, loosen the lock nuts enough that the sensor will stay in place without turning, but can be rotated by hand.
2. Rotate the sensor until the voltage reading is within specification. If the sensor cannot be rotated on the slots enough to meet specification, rotate the throttle adaptor shaft on the throttle nut as needed to allow the sensor to meet specification. (See Throttle Position Sensor Removal and Installation in Section 40, Group



B—A Terminal

N—B Terminal

60.) as needed to assist in rotating the throttle adaptor shaft.

IMPORTANT: Avoid Damage! Torque specification is critical.

3. With the test kit still attached, tighten the two nuts to specification, being sure that the voltage reading does not change.

Throttle Position Sensor—Specification

Input—Voltage.....	5.0 ± 0.2 V
Slow Idle Position Signal	
—Voltage.....	0.7—0.9 V
Fast Idle Position Signal	
—Voltage.....	2.0—3.7 V
	greater than slow idle signal voltage
Lock Nut —Torque.....	5 N·m (44 lb.-in.)

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eHydro™—Forward and Reverse Pedal Sensor Test and Adjustment

Purpose:

The drive pedal sensors are tested based upon the proper voltage input and output with the pedal in the released and pressed positions.

The display panel (Diagnostic mode 2, preferred method) or the test kit (JDG1575, optional method) can be used to test the drive pedal sensor.

Procedure—Diagnostic Mode 2:

Test Conditions:

- Key switch in run position, engine not running.
 - Throttle against stop in slow idle position.
 - Drive pedals in neutral position.
 - Park brake locked.
1. Park machine safely and set to test conditions.
 2. Enter the diagnostic mode 2. (See Entering Diagnostic and Calibration Modes in Section 40, Group 45.), and see Diagnostic Mode 2 (eHydro™/Auto HST).
 3. Toggle the right turn signal switch to display position 17 (FP__X.X) for forward or position 18 (rP__X.X) for reverse.
 4. Verify the drive pedal being tested is in the neutral position and note the voltage on the display panel.
 5. Fully depress the drive pedal being tested and note the voltage on the display panel.
 6. If the voltage readings are not within specification, adjust the forward and reverse pedal sensor.

Drive Pedal—Specification

Input —Torque.....	5.0 ± 0.2 V
Released Position	
Signal—Voltage (greater than released signal voltage).....	0.6—0.9 V
Pressed Position Signal	
—Voltage (greater than released signal voltage).....	2.7—3.5 V

Lock Nut —Torque..... 5 N·m (44.25 lb-in)

Procedure—Test Kit:

Test Equipment:

- JDG1575 Test Kit

Test Conditions:

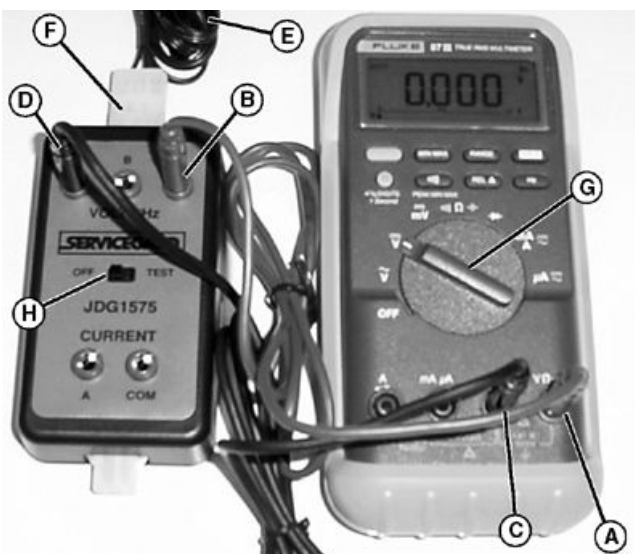
- Key switch in run position, engine not running.
- Drive pedals released.
- Range transmission in neutral.
- Park brake locked.
- Position sensor adaptor connected to forward or reverse pedal position sensor and 3 pin extender harness.
- Red lead connected to multimeter and connector box.
- Black lead connected to multimeter and connector box.

NOTE: Make sure key switch is in OFF position when disconnecting sensor. If key switch is in RUN position and sensor connector is disconnected for longer than three seconds, the sensor will have to be calibrated. (See eHydro™—Electronic Drive Controller System Calibration in Section 40, Group 45.)

1. Park machine safely and set to test conditions.
2. Locate and remove cover from forward and reverse pedal bracket located under operator's platform.
3. Connect the red lead to the Volt, Ohms, Hz input jack (A) of the multimeter and the voltage C terminal (B) of the connector box.
4. Connect the black lead to the COM input jack (C) of the multimeter and the voltage A terminal (D) of the connector box.
5. Connect the 3-pin extender harness (E) into the 3-pin connector (F) of the connector box.
6. Set the multimeter selector (G) to the DCV position.
7. Set breakout box switch to off position (H).

Continued on next page

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A—HZ Input Jack
B—Voltage C Terminal
C—COM Input Jack
D—Voltage A Terminal

E—3-Pin Extender Harness
F—3-Pin Connector
G—Multimeter Selector
H—Off Position

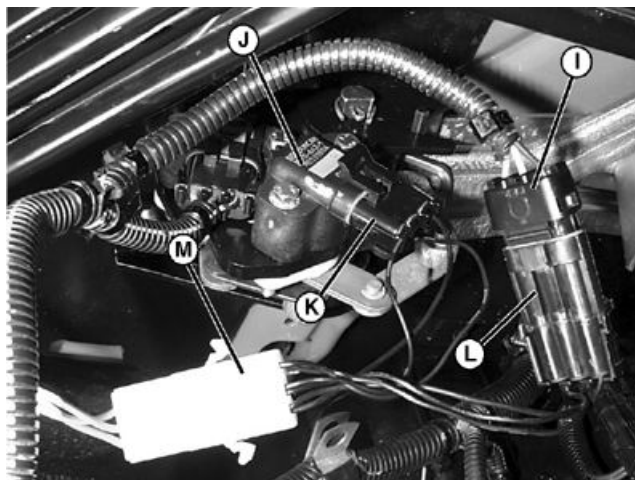
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8. Unplug the machine wiring harness (I) from the reverse pedal sensor (J).
9. Connect the male connector (K) of the position sensor adaptor into the reverse pedal sensor (J) and the female connector (L) into the machine wiring harness (I).
10. Plug the connector (M) into the extender harness.
11. Turn the key switch to the RUN position.
12. The voltage reading (input voltage) across the C and A terminals of the connector box should be at specification. If not, test the power circuit. (See [Power Circuit Operation](#) in Section 40, Group 35.)

I— Machine Wiring Harness
J— Reverse Pedal Sensor
K—Male Connector

L—Female Connector
M—Connector



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13. Move the red lead on the connector box from the C terminal (B) to the B terminal (N).

NOTE: If the sensor needs to be replaced or adjusted, perform the sensor manual calibration. (See eHydro™—Electronic Drive Controller System Calibration in Section 40, Group 45.)

14. The voltage reading (released position signal voltage) across the B and C terminals of the connector box should be at specification. If not, adjust the reverse pedal sensor to specification.
15. Fully press the reverse pedal. The voltage reading (pressed position signal voltage) across the B and A terminals of the connector box should be at specification. If not, and if the sensor has been adjusted correctly, replace the sensor.

NOTE: Make sure key switch is in OFF position when disconnecting sensor. If key switch is in RUN position and sensor connector is disconnected for longer than three seconds, the sensor will have to be calibrated. (See eHydro™—Electronic Drive Controller System Calibration in Section 40, Group 45.)

16. Turn key switch to OFF position.
17. Disconnect the position sensor adapter harness from the machine wiring harness and the reverse pedal position sensor, then connect the machine wiring harness to the reverse pedal position sensor.
18. Repeat this procedure for the forward pedal sensor.

Drive Pedal Sensor Adjustment:

1. If the voltage reading is not within specification, loosen the lock nuts enough that the sensor will stay in place without turning, but can be rotated by hand.
2. Rotate the sensor until the voltage reading is within specification.



B—C Terminal N—B Terminal

IMPORTANT: Avoid Damage! Torque specification is critical.

3. With the test kit still attached, tighten the two nuts to specification, being sure that the voltage reading does not change.

Drive Pedal —Specification	
Input—Voltage.....	5.0 ± 0.2 V
Released Position Signal	
—Voltage.....	0.6—0.9 V
Pressed Position Signal	
—Voltage.....	2.7—3.5 V
	greater than released signal voltage
Lock Nut —Torque.....	5 N·m (44.25 lb-in)

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Auto HST—Drive Pedal Sensor Test and Adjustment

Purpose:

The drive pedal sensor is tested based upon the proper voltage input and output with the pedal in the released and pressed positions.

The display panel (Diagnostic mode 2, preferred method) or the test kit (JDG1575, optional method) or Service ADVISOR™ (optional method) can be used to test the drive pedal sensor.

Procedure—Diagnostic Mode 2:

Test Conditions:

- Key switch in run position, engine not running.
 - Throttle lever against stop in slow idle position.
 - Drive pedal in released position.
 - Park brake locked.
1. Park machine safely and set to test conditions.
 2. Enter the diagnostic mode 2. (See Entering Diagnostic and Calibration Modes in Section 40, Group 45.), and see Diagnostic Mode 2 (eHydro™/Auto HST).
 3. Toggle the right turn signal switch to display position 15 (FP__X.X) for forward.
 4. Verify the drive pedal is in the released position and note the voltage on the display panel.
 5. Fully depress the drive pedal and note the voltage on the display panel.
 6. If the voltage readings are not within specification, adjust the drive pedal sensor.

Drive Pedal —Specification

Input —Voltage.....	5.0 ± 0.2 V
Released Position Signal	
—Voltage.....	0.6—0.9 V
Pressed Position Signal	
—Voltage.....	2.7—3.5 V
	greater than released signal voltage

Lock Nut —Torque..... 5 N·m (44 lb-in)

Procedure—Test Kit:

Test Equipment:

- JDG1575 Test Kit

Test Conditions:

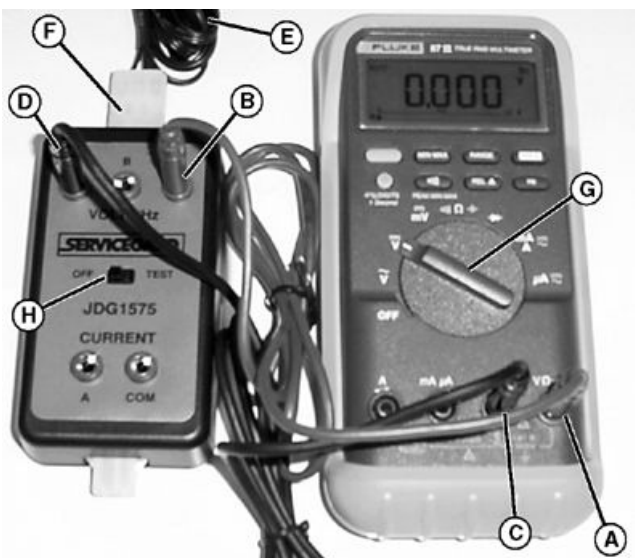
- Key switch in run position, engine not running.
- Drive pedal in released position.
- Range transmission in neutral.
- Park brake locked.
- Position sensor adaptor connected to drive pedal position sensor and 3 pin extender harness.
- Red lead connected to multimeter and connector box.
- Black lead connected to multimeter and connector box.

NOTE: Make sure key switch is in OFF position when disconnecting sensor. If key switch is in RUN position and sensor connector is disconnected for longer than three seconds, the sensor will have to be calibrated. (See Auto HST—Electronic Drive Controller System Calibration in Section 40, Group 45.)

1. Park machine safely and set to test conditions.
2. Locate and remove cover from forward pedal bracket located under operator's platform.
3. Connect the red lead to the Volt, Ohms, Hz input jack (A) of the multimeter and the voltage C terminal (B) of the connector box.
4. Connect the black lead to the COM input jack (C) of the multimeter and the voltage A terminal (D) of the connector box.
5. Connect the 3-pin extender harness (E) into the 3-pin connector (F) of the connector box.
6. Set the multimeter selector (G) to the DCV position.
7. Set breakout box switch to off position (H).

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A—HZ Input Jack
B—Voltage C Terminal
C—COM Input Jack
D—Voltage A Terminal

E—3-Pin Extender Harness
F—3-Pin Connector
G—Multimeter Selector
H—Off Position

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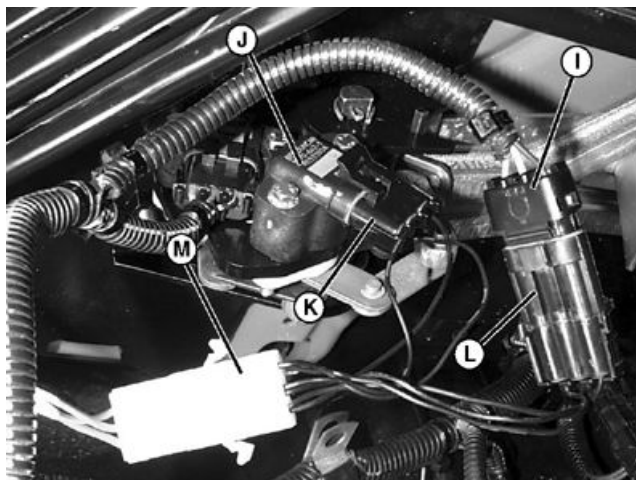
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8. Unplug the machine wiring harness (I) from the drive pedal sensor (J).
9. Connect the male connector (K) of the position sensor adaptor into the drive pedal sensor (J) and the female connector (L) into the machine wiring harness (I).
10. Plug the connector (M) into the extender harness.
11. Turn the key switch to the RUN position, engine not running.
12. The voltage reading (input voltage) across the C and A terminals of the connector box should be at specification. If not, test the power circuit. (See [Power Circuit Operation](#) in Section 40, Group 35.)

I— Machine Wiring Harness
J— Drive Pedal Sensor
K—Male Connector

L— Female Connector
M—Connector



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13. Move the red lead on the connector box from the C terminal (B) to the B terminal (N).

NOTE: If the sensor needs to be replaced or adjusted, perform the sensor manual calibration. (See eHydro™—Electronic Drive Controller System Calibration in Section 40, Group 45.)

14. The voltage reading (released position signal voltage) across the B and C terminals of the connector box should be at specification. If not, adjust the drive pedal sensor to specification.

15. Fully press the drive pedal. The voltage reading (pressed position signal voltage) across the B and A terminals of the connector box should be at specification. If not, and if the sensor has been adjusted correctly, replace the sensor.

NOTE: Make sure key switch is in OFF position when disconnecting sensor. If key switch is in RUN position and sensor connector is disconnected for longer than three seconds, the sensor will have to be calibrated. (See Auto HST—Electronic Drive Controller System Calibration in Section 40, Group 45.)

16. Turn key switch to OFF position.

17. Disconnect the position sensor adapter harness from the machine wiring harness and the drive pedal position sensor, then connect the machine wiring harness to the drive pedal position sensor.

Drive Pedal Sensor Adjustment:

1. If the voltage reading is not within specification, loosen the lock nuts enough that the sensor will stay in place without turning, but can be rotated by hand.
2. Rotate the sensor until the voltage reading is within specification.

IMPORTANT: Avoid Damage! Torque specification is critical.



B—C Terminal

N—B Terminal

3. With the test kit still attached, tighten the two nuts to specification, being sure that the voltage reading does not change.

Drive Pedal —Specification

Input —Voltage.....	5.0 ± 0.2 V
Released Position Signal —Voltage.....	0.6—0.9 V
Pressed Position Signal —Voltage.....	2.7—3.5 V
	greater than released signal voltage
Lock Nut —Torque.....	5 N·m (44 lb-in)

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eHydro™—MFWD Speed Sensor Test

Purpose:

The MFWD speed sensor is tested based upon the proper voltage input and frequency output during a drive function.

The display panel (Diagnostic mode 2, preferred method) or the test kit (JDG1575, optional method) or Service ADVISOR™ (optional method) can be used to test the MFWD speed sensor.

Procedure—Diagnostic Mode 2:

Test Conditions:

Machine on jack stands.

Operator on seat.

Engine running with throttle at low idle.

Transmission in gear position A.

Park brake unlocked.

1. Verify engine speed is set within specification. (See Slow Idle Adjustment in Section 03, Group 05.) in the Engine section.
2. Park machine safely and set to test conditions.
3. Enter the diagnostic mode 2. (See Entering Diagnostic and Calibration Modes in Section 40, Group 45.), and see Diagnostic Mode 2 (eHydro™/Auto HST)..
4. Toggle the right turn signal switch to display position 11 (gSXXXX) for ground speed.
5. With the engine running at low idle and the range transmission in gear position A, fully depress the forward drive pedal and note the frequency reading on the display panel. Move the throttle lever to the fast idle position and note display reading.
6. Release the forward pedal, move the throttle lever to the low idle position and shift the range transmission to gear position B. Go to Step 5.
7. Release the forward pedal, move the throttle lever to the low idle position and shift the range transmission to gear position C. Go to Step 5.
8. If the frequency readings are not within specifications, replace the MFWD speed sensor.

MFWD—Specification

Input—Voltage.....	5.0 ± 0.2 V
Gear A—Low	
Idle—Frequency.....	233 ± 0.1 kHz

Gear A—High	
Idle—Frequency.....	650 ± 2.0 kHz
Gear B— Low	
Idle—Frequency.....	414 ± 0.1 kHz
Gear B—High	
Idle—Frequency.....	710 ± 2.0 kHz
Gear C—Low	
Idle—Frequency.....	970 ± 0.1 kHz
Gear C— High	
Idle—Frequency.....	2923 ± 2.0 kHz

Procedure—Test Kit:

Test Equipment:

- JDG1575 Test Kit

Test Conditions:

- Machine on jack stands.
- Operator on seat.
- Engine running with throttle at low idle.
- Transmission in gear position A.
- Park brake unlocked.
- Speed sensor adaptor connected to MFWD sensor and 3 pin extender harness.
- Red lead connected to multimeter and connector box.
- Black lead connected to multimeter and connector box.

1. Verify engine speed is set within specification. (See Slow Idle Adjustment in Section 03, Group 05.) in the Engine section.

⚠ CAUTION: Avoid Injury! Position machine safely on jack stands so that ALL four wheels spin freely.

2. Park machine safely and set to test conditions.
3. Install jack stands under machine so that ALL wheels are off the ground and are free to spin.
4. Connect the red lead to the volt, ohms, Hz input jack (A) of the multimeter and the voltage C terminal (B) of the breakout box.
5. Connect the black lead to the COM input jack (C) of the multimeter and the voltage A terminal (D) of the breakout box.
6. Connect the 3 pin extender harness (E) into the 3 pin connector (F) of the breakout box.
7. Set the multimeter to measure DC volts.
8. Set breakout box switch to off position (G).



A—HZ Input Jack
B—Voltage C Terminal
C—COM Input Jack
D—Voltage A Terminal

E—3-Pin Extender Harness
F—3-Pin Connector
G—Off Position

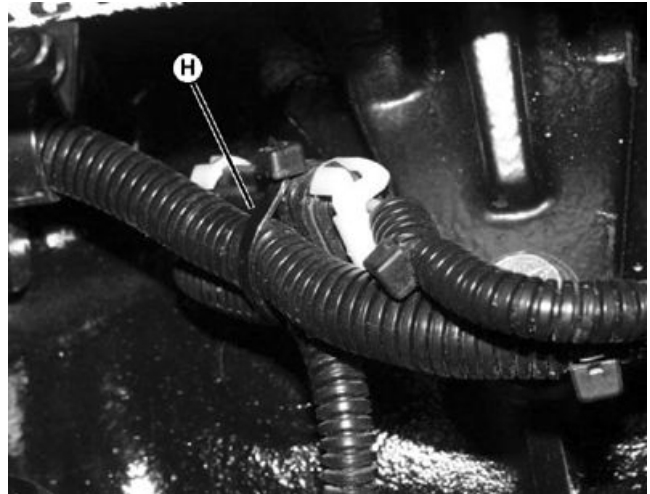
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9. Cut plastic tie securing MFWD connector.

H—Plastic Tie

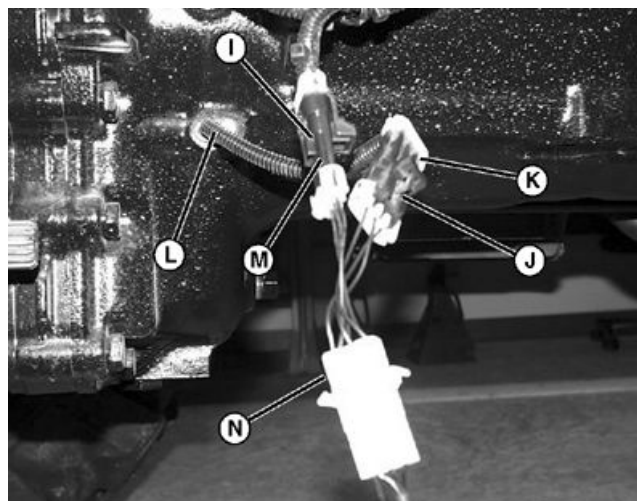


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10. Disconnect the machine wiring harness (I) from the MFWD speed sensor connector (K).
11. Connect the male connector (J) of the speed sensor adapter into the MFWD speed sensor (L) and the female connector (M) into the machine wiring harness (H).
12. Plug the connector (N) into the extender harness.
13. Start and run the engine at slow idle.
14. Unlock the park brake.
15. Place the range transmission in gear position A.
16. Press and hold the forward drive pedal at the full drive position.
17. The voltage reading (input voltage) across the A and C terminals of the connector box should be at specification. If not, test the power circuit. (See [Power Circuit Operation](#) in Section 40, Group 35.)
18. Release the forward drive pedal.



I— Machine Wiring Harness
J— Male Connector
K—MFWD Speed Sensor Connector

L— MFWD Speed Sensor
M—Female Connector
N—Connector

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19. Set the multimeter to measure frequency (Hz).
20. Move the red lead on the connector box from the C terminal (B) to the B terminal (O).
21. Press and hold the forward drive pedal at the full drive position.
22. The frequency reading (terminals A to B signal Hz at slow idle) should be at specification. If not, replace the MFWD speed sensor.
23. Move the throttle lever to the fast idle position.
24. The frequency reading (terminals A to B signal Hz at fast idle) should be at specification. If not, replace the MFWD speed sensor.
25. Release the forward drive pedal and move the throttle lever to the slow idle position.
26. Place the range transmission in gear position B.
27. The frequency reading (terminals A to B signal Hz at slow idle) should be at specification. If not, replace the MFWD speed sensor.
28. Move the throttle lever to the fast idle position.
29. The frequency reading (terminals A to B signal Hz at fast idle) should be at specification. If not, replace the MFWD speed sensor.
30. Release the forward drive pedal and move the throttle lever to the slow idle position.
31. Place the range transmission in gear position C.
32. The frequency reading (terminals A to B signal Hz at slow idle) should be at specification. If not, replace the MFWD speed sensor.
33. Move the throttle lever to the fast idle position.
34. The frequency reading (terminals A to B signal Hz at fast idle) should be at specification. If not, replace the MFWD speed sensor.
35. Release the forward drive pedal and move the throttle lever to the slow idle position.
36. Lock the park brake and stop engine.
37. Disconnect the speed sensor adapter harness from the machine wiring harness and the MFWD speed sensor.



LVAL11761—UN—02NOV10

B—C Terminal

O—B Terminal

38. Connect the machine wiring harness to the MFWD speed sensor. Secure with plastic tie.

MFWD—Specification

Input —Voltage.....	5.0 ± 0.2 V
Gear A—Low	
Idle—Frequency.....	233 ± 0.1 kHz
Gear A—High	
Idle—Frequency.....	650 ± 2.0 kHz
Gear B— Low	
Idle—Frequency.....	414 ± 0.1 kHz
Gear B—High	
Idle—Frequency.....	710 ± 2.0 kHz
Gear C—Low	
Idle—Frequency.....	970 ± 0.1 kHz
Gear C— High	
Idle—Frequency.....	2923 ± 2.0 kHz

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Auto HST—MFWD Speed Sensor Test

Purpose:

The MFWD speed sensor is tested based upon the proper voltage input and frequency output during a drive function.

The display panel (Diagnostic mode 2, preferred method) or the test kit (JDG1575, optional method) or Service ADVISOR™ (optional method) can be used to test the MFWD speed sensor.

Procedure—Diagnostic Mode 2:

Test Conditions:

- Machine on jack stands.
 - Operator on seat.
 - Foot throttle cable disconnected.
 - Engine running with throttle at low idle.
 - Transmission in initially gear position A.
 - Park brake unlocked.
1. Verify engine speed is set within specification. (See Slow Idle Adjustment in Section 03, Group 05.) in the Engine section.
 2. Park machine safely and set to test conditions.
 3. Enter the diagnostic mode 2. (See Entering Diagnostic and Calibration Modes in Section 40, Group 45.), and see Diagnostic Mode 2 (eHydro™/Auto HST).
 4. Toggle the right turn signal switch to display position 9 (gSXXXX) for ground speed.
 5. With the engine running at low idle and the range transmission in proper gear position, place the FNR lever in the forward position and fully depress the drive pedal and note the frequency reading on the display panel. Move the hand throttle lever to the fast idle position and note display reading.
 6. Release the drive pedal, move the hand throttle lever to the low idle position and shift the range transmission to gear position B. Go to Step 5.
 7. Release the drive pedal, move the hand throttle lever to the low idle position and shift the range transmission to gear position C. Go to Step 5.
 8. If the frequency readings are not within specification, replace the MFWD speed sensor.

MFWD—Specification

Input—Voltage.....	5.0 ± 0.2 V
Gear A—Low	
Idle—Frequency.....	233 ± 0.1 kHz

Gear A—High	
Idle—Frequency.....	650 ± 2.0 kHz
Gear B— Low	
Idle—Frequency.....	414 ± 0.1 kHz
Gear B—High	
Idle—Frequency.....	710 ± 2.0 kHz
Gear C—Low	
Idle—Frequency.....	970 ± 0.1 kHz
Gear C— High	
Idle—Frequency.....	2923 ± 2.0 kHz

Procedure—Test Kit:

Test Equipment:

- JDG1575 Test Kit

Test Conditions:

- Machine on jack stands.
 - Operator on seat.
 - Foot throttle cable disconnected.
 - Engine running with throttle at low idle.
 - Transmission in gear position A.
 - Park brake unlocked.
 - Speed sensor adaptor connected to MFWD sensor and 3 pin extender harness.
 - Red lead connected to multimeter and connector box.
 - Black lead connected to multimeter and connector box.
1. Verify engine speed is set within specification. (See Slow Idle Adjustment in Section 03, Group 05.) in the Engine section.

⚠ CAUTION: Avoid Injury! Position machine safely on jack stands so that ALL four wheels spin freely.

2. Park machine safely and set to test conditions.
3. Install jack stands under machine so that ALL wheels are off the ground and are free to spin.
4. Connect the red lead to the volt, ohms, Hz input jack (A) of the multimeter and the voltage C terminal (B) of the breakout box.
5. Connect the black lead to the COM input jack (C) of the multimeter and the voltage A terminal (D) of the breakout box.
6. Connect the 3 pin extender harness (E) into the 3 pin connector (F) of the breakout box.
7. Set the multimeter to measure DC volts.
8. Set breakout box switch to off position (G).

Continued on next page

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A—HZ Input Jack
B—Voltage C Terminal
C—COM Input Jack
D—Voltage A Terminal

E—3-Pin Extender Harness
F—3-Pin Connector
G—Off Position

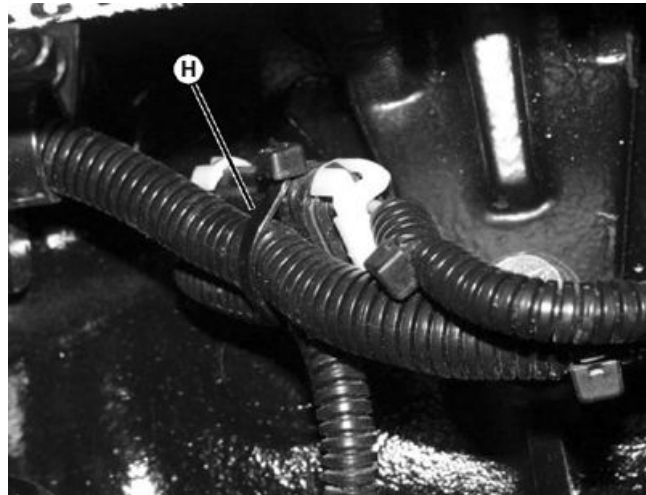
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KN52281,10044B2 -19-02NOV12-2/5

9. Cut plastic tie securing MFWD connector.

H—Plastic Tie

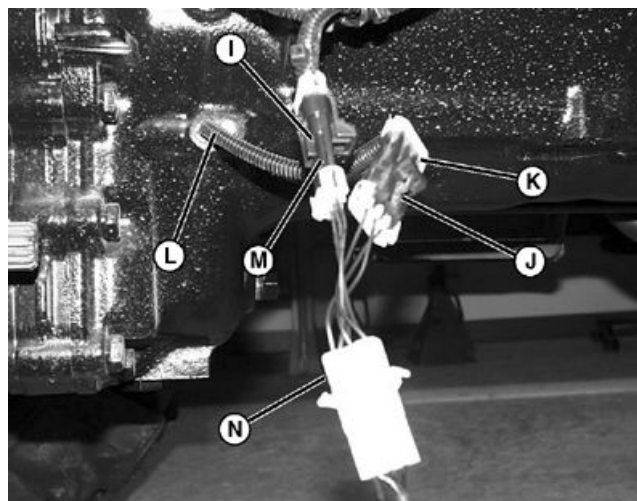


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10. Disconnect the machine wiring harness (I) from the MFWD speed sensor connector (K).
11. Connect the male connector (J) of the speed sensor adapter into the MFWD speed sensor (L) and the female connector (M) into the machine wiring harness (H).
12. Plug the connector (N) into the extender harness.
13. Start and run the engine at slow idle.
14. Unlock the park brake.
15. Place the range transmission in gear position A.
16. Place the FNR lever in the forward position.
17. Press and hold the drive pedal at the full drive position.
18. The voltage reading (input voltage) across the A and C terminals of the connector box should be at specification. If not, test the power circuit. (See [Power Circuit Operation](#) in Section 40, Group 35.)
19. Release the drive pedal.



I— Machine Wiring Harness	L— MFWD Speed Sensor
J— Male Connector	M— Female Connector
K— MFWD Speed Sensor Connector	N— Connector

Continued on next page

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20. Set the multimeter to measure frequency (Hz).
21. Move the red lead on the connector box from the C terminal (B) to the B terminal (O).
22. Press and hold the drive pedal at the full drive position.
23. The frequency reading (terminals A to B signal Hz at slow idle) should be at specification. If not, replace the MFWD speed sensor.
24. Move the throttle lever to the fast idle position.
25. The frequency reading (terminals A to B signal Hz at fast idle) should be at specification. If not, replace the MFWD speed sensor.
26. Release the drive pedal and move the hand throttle lever to the slow idle position.
27. Place the range transmission in gear position B.
28. The frequency reading (terminals A to B signal Hz at slow idle) should be at specification. If not, replace the MFWD speed sensor.
29. Move the hand throttle lever to the fast idle position.
30. The frequency reading (terminals A to B signal Hz at fast idle) should be at specification. If not, replace the MFWD speed sensor.
31. Release the drive pedal and move the hand throttle lever to the slow idle position.
32. Place the range transmission in gear position C.
33. The frequency reading (terminals A to B signal Hz at slow idle) should be at specification. If not, replace the MFWD speed sensor.
34. Move the hand throttle lever to the fast idle position.
35. The frequency reading (terminals A to B signal Hz at fast idle) should be at specification. If not, replace the MFWD speed sensor.
36. Release the drive pedal and move the hand throttle lever to the slow idle position.
37. Lock the park brake and stop engine.
38. Disconnect the speed sensor adapter harness from the machine wiring harness and the MFWD speed sensor.



LVAL11765—UN—02NOV10

B—C Terminal

O—B Terminal

39. Connect the machine wiring harness to the MFWD speed sensor. Secure with plastic tie.

MFWD—Specification

Input —Voltage.....	5.0 ± 0.2 V
Gear A—Low	
Idle—Frequency.....	233 ± 0.1 kHz
Gear A—High	
Idle—Frequency.....	650 ± 2.0 kHz
Gear B— Low	
Idle—Frequency.....	414 ± 0.1 kHz
Gear B—High	
Idle—Frequency.....	710 ± 2.0 kHz
Gear C—Low	
Idle—Frequency.....	970 ± 0.1 kHz
Gear C— High	
Idle—Frequency.....	2923 ± 2.0 kHz

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eHydro™—Service ADVISOR™ Diagnostic Application

are available. (See Service ADVISOR™ Connection Procedure in Section 40, Group 55.)

When Service ADVISOR™ is connected to the machine using a computer, the following readings and setting

Function	Displayed Value or Range	Units	Description
Application Software Version			Displays software version.
Backup Digital Output	On or Off		Displays when the backup alarm is on or off.
Brake Switch	On or Off		Displays when the brake switch is on or off.
Calibration Switch	On or Off		Displays when the calibration switch is on or off.
Chassis Size	Mid Chassis		Displays chassis size group.
Command %	0—100%	%	Forward or reverse pedal command percentage.
Communication Compatibility Code			
Cruise Error		Hz	Cruise set point verses MFWD speed.
Cruise On Digital Output	On or Off		
Cruise On Off Switch	On or Off		
Cruise RES ACC Switch	On or Off		
Cruise SET DEC Switch	On or Off		
Cruise Set Point	0 -?	Hz	
Current Output	0-1800	mA	Displays the amount of current flow the HST controller is outputting to the proportional solenoid when either the forward/drive or reverse (eHydro) pedal is depressed.
Direction Command (eHydro™ and Auto HST)	Neutral, Forward, or Reverse		Displays the direction of movement detected by the HST controller.
Feed Forward %		%	Engineering Use Only
Engine Setpoint RPM		rpm	Engine Setpoint RPM is established by the position of the throttle potentiometer giving the HST controller the desired engine RPM. Used for "Load Match Logic".
Engine Speed Frequency		Hz	Displays engine speed frequency.
Engine Speed RPM		rpm	Displays engine speed calculated from "Engine Speed Frequency" reading.
EOL Software Version			Displays software version.
Fault Digital Output	On or Off		
Filtered MFWD Speed		Hz	MFWD speed displayed in Hertz.
Final Command %	0—100	%	Percentage of current flowing to the forward or reverse proportional valve coil.
Forward/Drive Pedal %	0—100	%	The voltage reading converted to a percentage value by the HST controller for the forward/drive potentiometer.
Forward Pedal/Drive Cal High (V)		volts	Calibrated high value in volts of the forward/drive potentiometer.
Forward/Drive Pedal Cal Low (V)		volts	Calibrated low value in volts of the forward/drive potentiometer.
Forward/Drive Pedal Volts		volts	Actual voltage of the forward/drive potentiometer in current position.
Forward Threshold mA		mA	Calibrated milliamp value of the forward proportional solenoid valve.
Hardware ID			

Continued on next page

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Kernel Version			
Load Match Command %		%	Percent of de-stroke.
Load Match Switch	On or Off		
Load Match Switch Software	On or Off		
Load Match Switch Option	1 or 2		
Load Resistance		ohm(s)	The calculated resistance value of the proportional drive coil circuit that is currently in use, either forward or reverse. Default value of 16 ohms will be displayed when the data point is opened.
Machine State	Run_Mode, Cal_Mode, Cal_FWD, Cal_RVS, Cal_Cal_TPS, Cal_FVL, or Cal_RVL, CAL_FNR		Displays current state of the machine.
Max Command %		%	Automotive cruise max speed.
Max Spd Lim Cmd %	0.0—?	%	Automotive cruise max speed.
Motion Match Setting 1	1—5		
Motion Match Setting 2	1—9		
Motion Match Switch	On or Off		
Motion Match Switch Option	1 or 2		
MFWD Speed	233 Hz at slow idle 2923 Hz at fast idle	Hz	Displays MFWD rotational speed at MFWD sensor.
Operator Present Switch	On or Off		Indicates when seat switch is in the ON or OFF position.
PID Command %		%	Engineering Use Only
Reverse Pedal % (eHydro™)		%	The voltage reading converted to a percentage value by the HST controller for the drive potentiometer.
Reverse Pedal Cal High (V) (eHydro™)		volts	Calibrated high value in volts of the reverse potentiometer.
Reverse Pedal Cal Low (V) (eHydro™)		volts	Calibrated low value in volts of the reverse potentiometer.
Reverse Pedal Volts (eHydro™)		volts	Actual voltage of the reverse potentiometer in current position.
Reverse Threshold mA		mA	Calibrated milliamp value of the reverse proportional solenoid valve.
State Command %		%	
State_Direction	Neutral, Forward, or Reverse		
Set Max Speed Switch	On or Off		
Throttle Sensor		%	
Throttle Sensor Cal High (V)		volts	Calibrated high value in volts of the throttle potentiometer.
Throttle Sensor Cal Low (V)		volts	Calibrated low value in volts of the throttle potentiometer.
Throttle Sensor Volts		volts	Actual voltage of the throttle potentiometer in current position.
Tractor Serial Number			Serial number of the machine.

eHydro™—Service ADVISOR™ Diagnostic Application

Calibration

Function	Displayed Value or Range	Units	Description
Forward Threshold mA	0-1000	mA	Warning: Setting value too high may cause excessive rollout and unexpected movement. (Recommended test value ~325mA)
Reverse Threshold mA	0-1000	mA	Warning: Setting value too high may cause excessive rollout and unexpected movement. (Recommended test value ~325mA)

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Retrieving Diagnostic Trouble Codes with Service ADVISOR™ Diagnostic Application™**Reason:**

To view active and stored diagnostic trouble codes (DTCs) using Service ADVISOR™ diagnostic application.

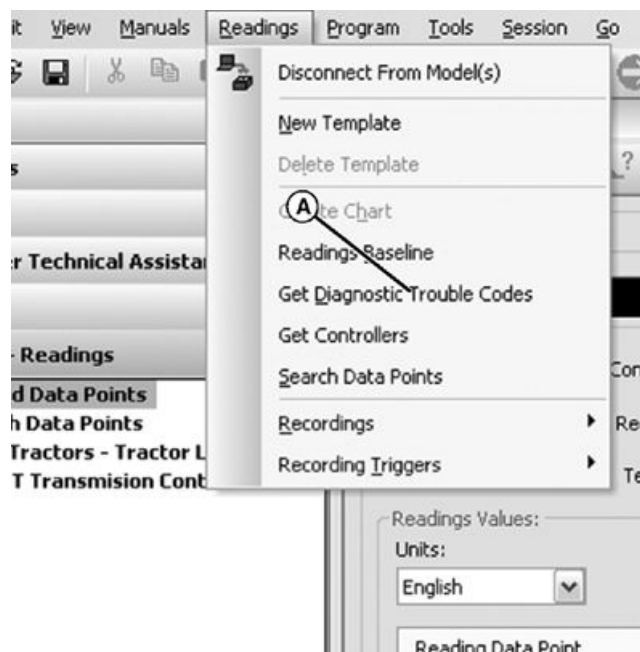
Equipment:

- Service ADVISOR™ Diagnostic Application Software
- Computer with Service ADVISOR™ Diagnostic Application Software installed.
- DS10130 Transmission Control Unit (TCU) Cable

Procedure:

1. Connect computer to machine. (See [Service ADVISOR™ Connection Procedure](#) in Section 40, Group 55.)
2. In the “Readings” drop-down menu, click on “Get Diagnostic Trouble Codes” (A).

A—Get Diagnostic Trouble Codes



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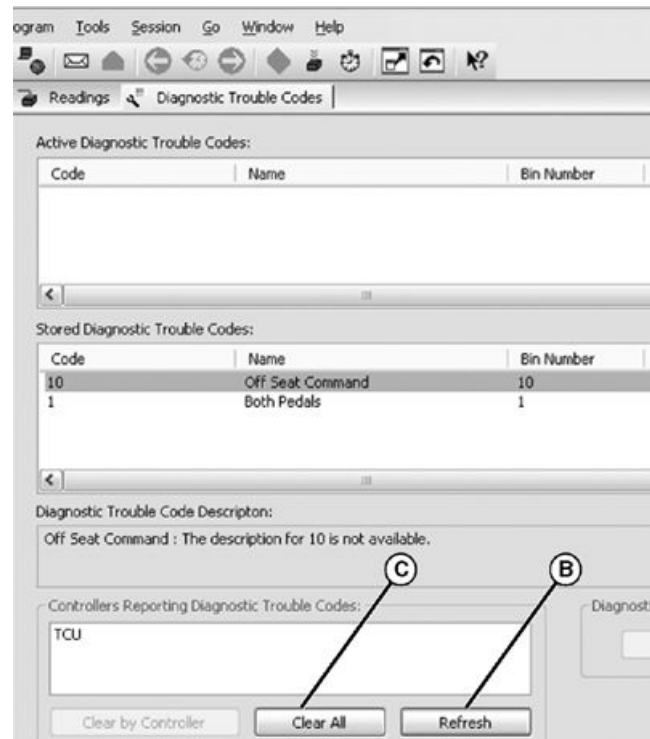
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KN52281,10044B4 -19-02NOV12-1/2

3. The “Diagnostic Trouble Codes” dialog box opens. Clicking on the “Refresh” button (B) updates the screen with any new active and stored diagnostic trouble codes. Clicking on the “Clear All” button (C) will clear all stored diagnostic trouble codes. For a list and description of diagnostic trouble codes (DTCs), (See Display Panel Fault Code Chart—eHydro™ in Section 40, Group 45.)

B—Refresh

C—Clear All



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Adding and Removing Data Points

Reason:

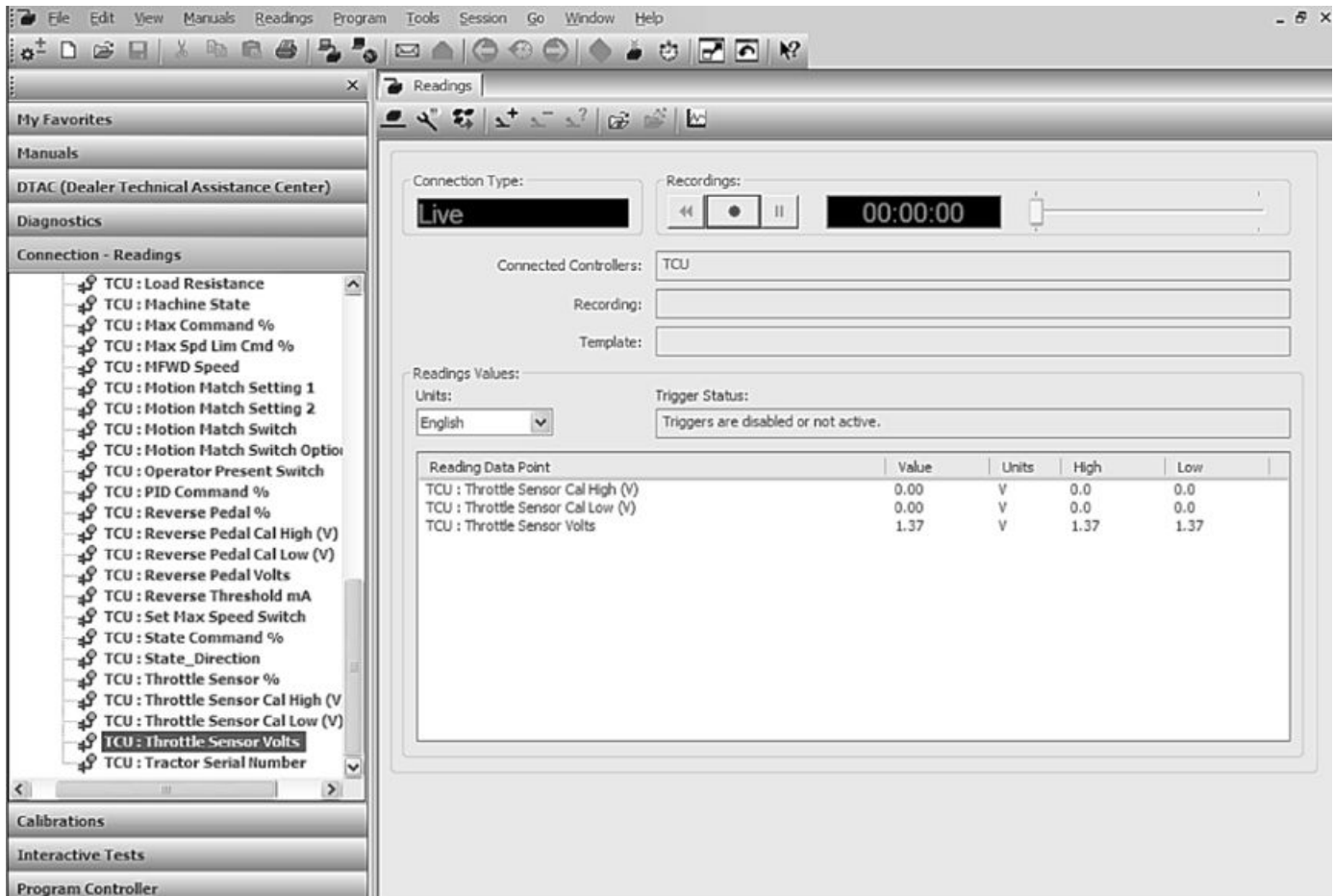
One or more machine functions can be monitored using Service ADVISOR™ diagnostic application.

Equipment:

- Service ADVISOR™ Diagnostic Application Software

- Computer
- DS10130 Transmission Control Unit (TCU) Cable

Procedure:



For Reference Only, Service ADVISOR™ Screen Captures May Vary

1. Connect computer to machine. (See [Service ADVISOR™ Connection Procedure](#) in Section 40, Group 55.)
2. The “Readings” dialog box can be populated by double clicking on any of the items located under the
3. “Connection—Readings” tab. One or more items can be monitored.
3. To remove a item from the “Readings” dialog box, click on the item and press the “Delete” key.

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Service ADVISOR™ Connection Procedure

Reason:

To connect machine to computer using Service ADVISOR™ diagnostic application.

Equipment:

- Service ADVISOR™ Diagnostic Software
- Computer
- DS10130 Transmission Control Unit (TCU) Cable

Procedure:

1. Connect 9-pin TCU cable connector (A) to computer.

A—9-Pin TCU Cable Connector

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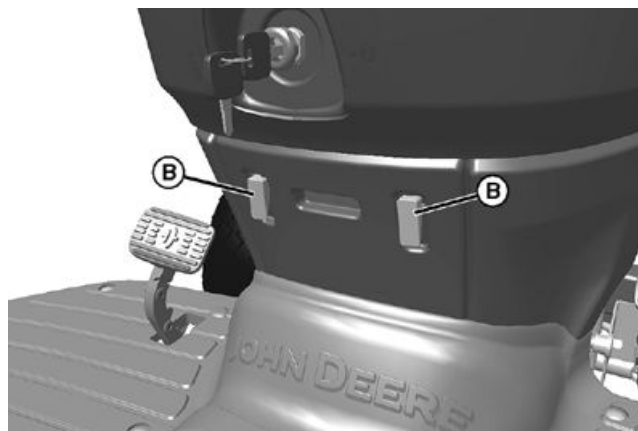


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2. Raise the two levers (B) and open load center cover.

B—Levers



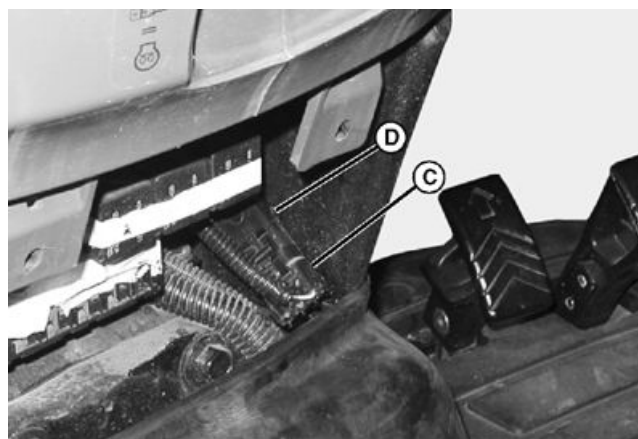
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3. Disconnect the 3-pin HST controller connector (C) from the main wiring harness connector (D).

C—3-Pin HST Controller Connector

D—Main Wiring Harness Connector



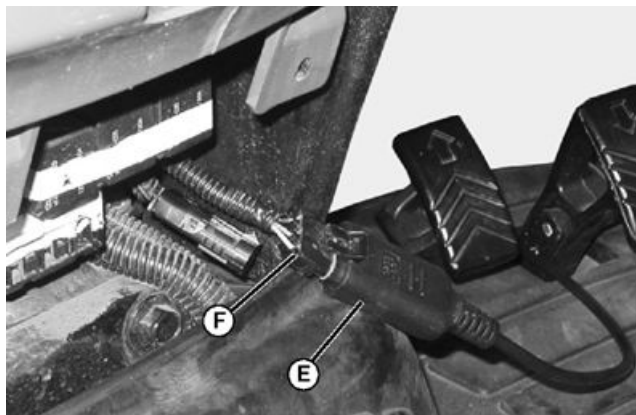
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4. Connect 3-pin TCU cable connector (E) to 3-pin HST controller connector (F).
5. Turn the key switch to the RUN position.
6. Start Service ADVISOR™ Diagnostic Software.

E—3-Pin TCU Cable Connector F—Controller Connector

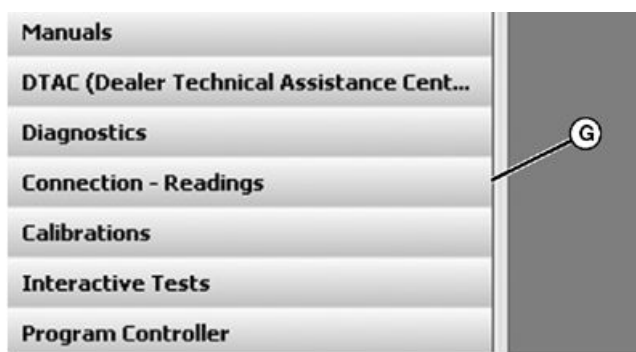


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KN52281,10044B6 -19-02NOV12-4/10

7. Click on the “Connection-Readings” tab (G).

G—Connection-Readings Tab



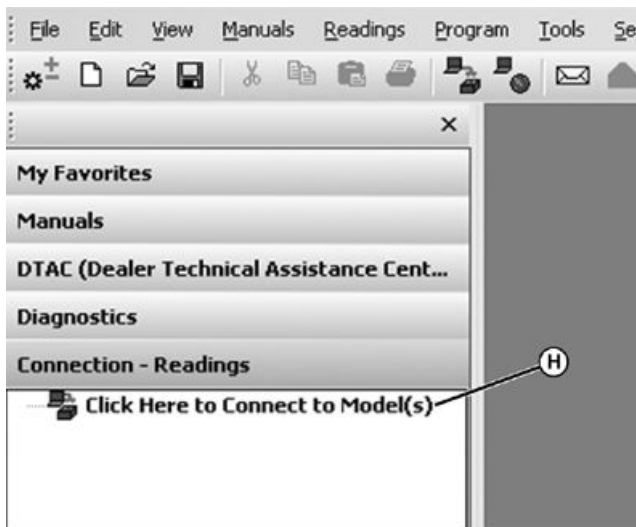
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For reference only, service ADVISOR™ screen captures may vary.

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8. Click on “Click Here to Connect to Model(s)” (H).

H—Click Here to Connect to Model(s)



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9. In the “Default Adapter” drop-down menu (I), select “Electronic Data Link (EDL) Stand-alone USB Device”. Select “Connect to One Vehicle Only” (J) and click on “Change Models” button (K).

I— Default Adapter Drop Down Menu
J— Connect to One Vehicle Only
K—Change Models Button

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10. In the “Model” box (L), enter the model number of the machine connected to Service ADVISOR™. When the model appears in the vehicle models window (M), select the model machine connected to Service ADVISOR™ (Model 3320 Tractors shown) and click on “Add Vehicle Model” button (N).

L— Model Box
M—Vehicle Model Window
N—Add Vehicle Model Button

Make	Model	Category	Sub Category
John Deere	3040	4WD Loader	None
John Deere	3120	Tractors	Compact Utility
John Deere	3120	Tractors	Compact Utility
John Deere	3320	Tractors	Compact Utility
John Deere	3320	Tractors	Compact Utility

LVAL11776—UN—02NOV10

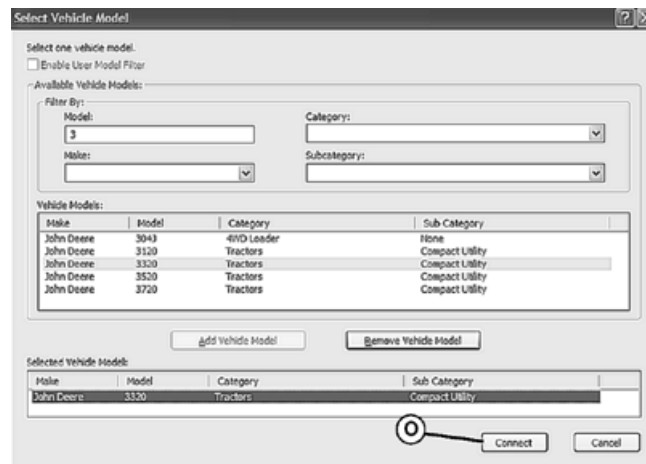
For reference only, Service ADVISOR™ screen captures may vary. Enter and select the model machine that is connected to Service ADVISOR™.

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KN52281,10044B6 -19-02NOV12-8/10

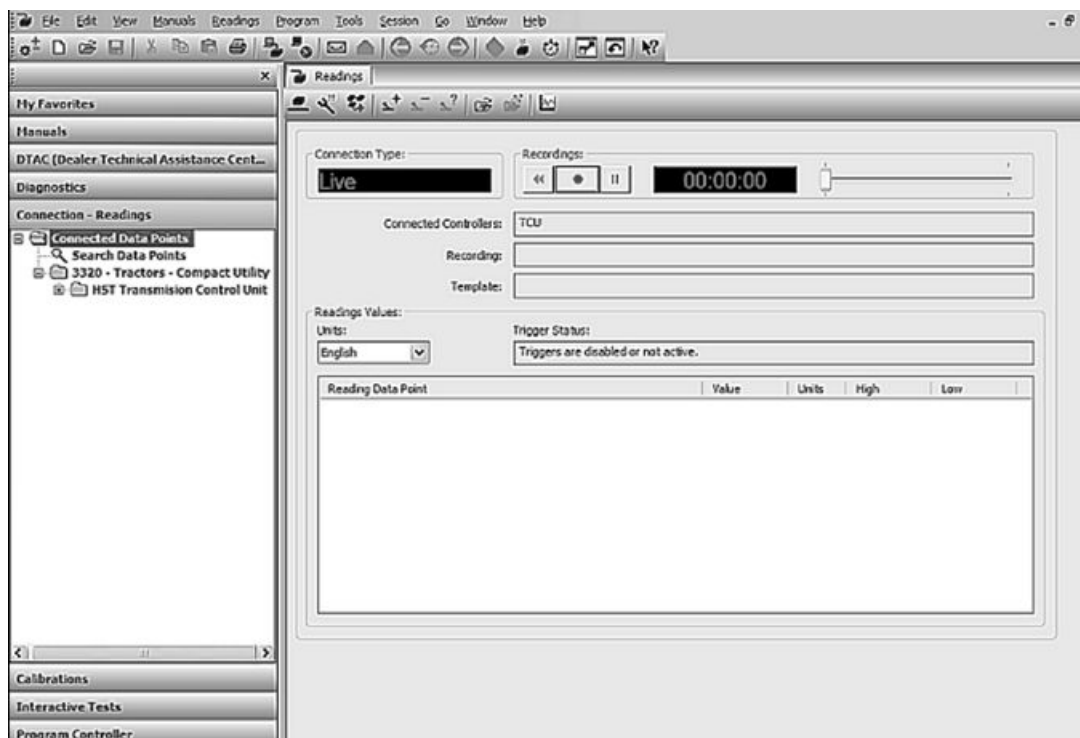
11. Click on the “Connect” button (O).

O—Connect Button



LVAL11777 —UN—02NOV10

KN52281,10044B6 -19-02NOV12-9/10

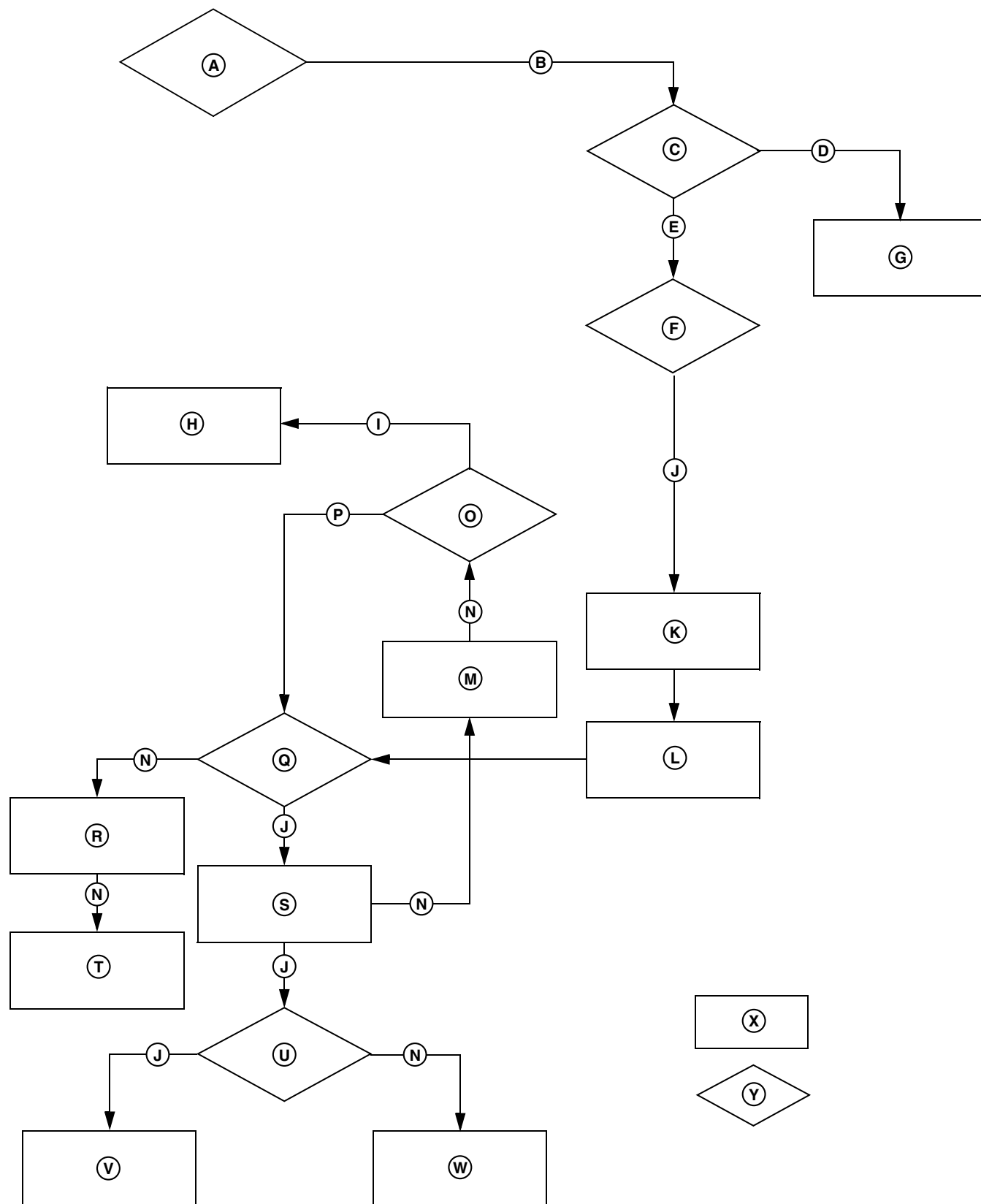


LVAL11778 —UN—02NOV10

12. The “Readings” dialog box opens, indicating Service ADVISOR™ is now connected to the machine.

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HST/Auto-HST Troubleshooting Flowchart



LVAL17477 —UN—29APR11

Continued on next page

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A—System Function
 B—No or Abnormal Function
 C—Fault Code
 D—Active Code
 E—On
 F—Check Power to Controller
 G—Diagnose Problem According to Error Flash Code
 H—Replace Controller
 I— Yes
 J— OK
 K—Fault Not Detectable or Not Related to Controller
 L—Connect Service ADVISOR™
 M—Download Payload

N—Not OK
 O—Spare Controller Available
 P—No
 Q—Check All External Switches
 R—Fix External Switches
 S—Check Outputs Proportional Current to Coils Using JDG1575

T—Download New Payload
 U—Check Hydraulic System
 V—Remove Hydro and Inspect
 W—Fix Hydraulic System
 X—Operator Action
 Y—Decision

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KN52281,10044B7 -19-02NOV12-2/2

eHydro™—eMatchOS Electronic Drive Controller Circuit Operation

Function:

The purpose of the drive controller is to control both the drive direction and speed of the machine. Additionally the drive controller provides for setting a maximum travel speed, cruise control, pedal aggressiveness, and load match to prevent stalling the engine during operation.

Each of these additional functions has the ability to be turned on or off by the operator.

General Theory:

The drive controller is a preprogrammed electrical device that allows the operator to control the machine drive direction and speed via the electrical inputs from the forward and reverse foot pedals. Under normal operating conditions, this creates an output to the corresponding directional control valve coil in the transmission.

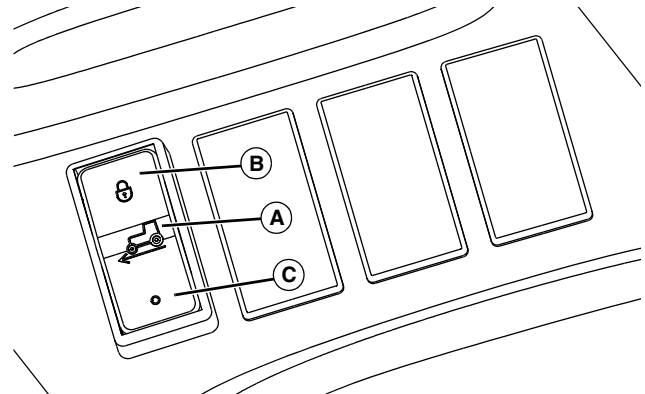
The output current to the directional valve coil is proportional to the pedal position. The forward and reverse pedals have an adjustable proportional setting (motion match). This setting allows for greater control, comfort and smoother operation when changing speed or direction. The same proportional setting affects both the forward and reverse command.

The rate of acceleration and deceleration is also controlled by the drive controller to smoothly ramp the speed up and down.

Cruise Control—Standard:

The cruise control feature allows the operator to set and hold a speed setting that the operator desires without having to press and hold the forward pedal.

The cruise control switch receives power from the switched power circuit on 552A, 552B and 552C Red



A—Cruise Control "On"
 B—Cruise Control "Lock"

C—Cruise Control "Off"

wires. Placing the cruise control switch to the on (center) position (A), supplies power from the 552C Red wire across the switch to the 238 Gry wire to the drive controller. This input enables the cruise control function.

Momentarily pressing the cruise control switch to the lock position (B) supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller. This input will set the cruise speed at the speed being traveled.

Once set, the drive controller monitors the machine speed and varies the current to the transmission forward directional solenoid to maintain travel speed at the set point.

To adjust travel speed, disengage cruise control and engage cruise control again at a different speed.

Placing the cruise control switch in the off position (C) or pressing either the right brake pedal or reverse pedal will disengage the cruise function.

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Cruise Control—Optional:

The cruise control feature allows the operator to set and hold a speed setting that the operator desires without having to press and hold the forward pedal.

The cruise/max speed switch receives power from the switched power circuit on 552A and 552C Red wires. The Res/ +, Set/—switch receives power from the switched power circuit on 552A and 552B Red wires.

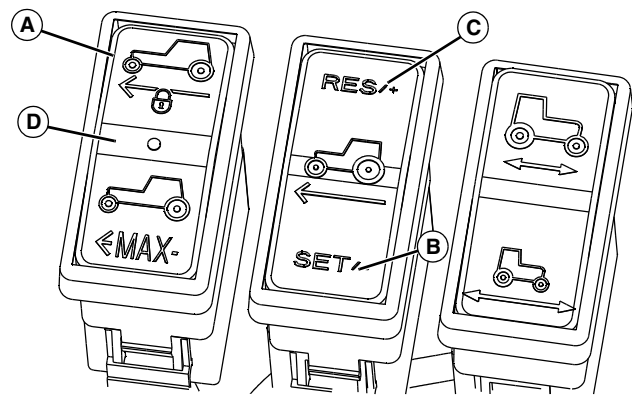
Placing the cruise/max speed switch to the cruise position, (A) supplies power from the 552C Red wire across the switch to the 238 Gry wire to the drive controller. This input enables the cruise control function. Once the machine is traveling at the desired speed, momentarily pressing the Res/ +, Set/—switch to the Set/- position (B) supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller. This input will set the cruise speed at the speed being traveled.

Once set, the drive controller monitors the machine speed through the MFWD sensor, and varies the current to the transmission forward directional solenoid to maintain travel speed at the set point.

The cruise speed setting can be increased and decreased while the machine is being driven by momentarily pressing either the Res/+ switch to increase the cruise speed or the Set/- switch to decrease the cruise speed setting.

Pressing the Res/+ side (C) of the switch supplies power from the 552B Red wire across the switch to the 266 Blu wire to the drive controller. Pressing the Set/- side (B) of the switch supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller.

Pressing Res/+, or Set/- positions of the switch to change the cruise speed setting will become effective immediately without returning to neutral.



A—Cruise Position
B—Set/- Position

C—Res/+ Position
D—Off Position

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The increase/decrease amount is a percentage of the actual machine speed.

Placing the cruise/max speed switch in the off (center) position (D) or pressing either the right brake pedal or reverse pedal will disengage the cruise function. The last speed setting is stored in the controller and if the operator is pressing the forward pedal, the Res/+ side (C) of the switch can be pressed to ramp back to the stored speed.

Placing the cruise/max speed switch in the off (center) position (D) erases the stored setting.

If changes in machine loading or range gear position settings do not allow for return to the previous speed setting, the controller will attempt to return to the speed setting by sending either the maximum (fastest speed possible) or minimum (slowest speed possible) drive current to the transmission forward directional solenoid.

Continued on next page

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Max Speed:

The max speed feature allows the operator to set the maximum speed the machine will travel when the drive pedal is fully depressed.

If the operator needs to return to a specific travel speed, the max speed setting will allow the machine to return to this specific speed setting while maintaining proportional acceleration and deceleration. Unlike cruise control, the max speed setting requires the operator to press and hold the drive pedal to obtain a travel function.

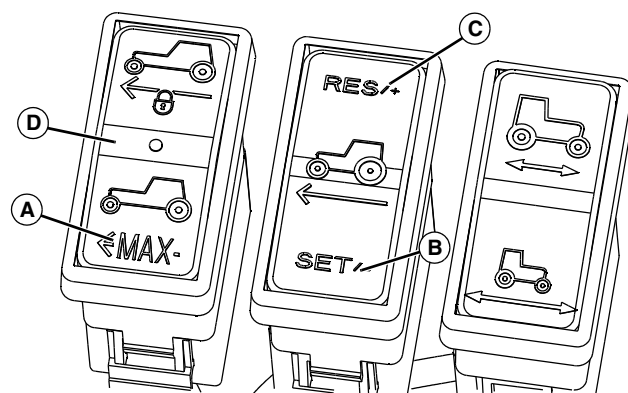
The cruise/max speed switch receives power from the switched power circuit on 552A and 552C Red wires. The Res/ +, Set/—switch receives power from the switched power circuit on 552A and 552B Red wires.

Placing the cruise/max speed switch to the max speed position (A), supplies power from the 552C Red wire across the switch to the 267 Pur wire to the drive controller. This input enables the max speed function. Once the machine is traveling at the desired speed, momentarily pressing the Res/ +, Set/—switch to the Set/- position (B) supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller. This input will set the max speed at the speed being traveled.

The maximum travel speed of the machine will then be limited to the speed the operator was traveling at as long as the max speed switch remains in the on position.

The max speed setting can be increased and decreased while the machine is being driven by momentarily pressing either the Res/+ side (C) of the switch to increase the max speed or the Set/- side (B) of the switch to decrease the max speed setting.

Pressing the Res/+ side (C) of the switch supplies power from the 552B Red wire across the switch to the 266 Blu wire to the drive controller. Pressing the Set/- side (B) of the switch supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller.



A—Max Speed Position
B—Set/- Position

C—Res/+ Position
D—Off Position

Using the Res/+ side of the switch or the Set/- side of the switch to change the max speed setting will become effective immediately without returning to neutral. The increase/decrease amount is a percentage of the actual machine speed.

The max speed function is disengaged when the max speed switch is placed in the off (center) position (D). Disengagement will become effective immediately.

Once the max speed setting is set it will be stored and is available until it is replaced by another setting or if the drive controller is replaced. Placing the max speed switch in the on position (A) will enable the last maximum speed setting.

If changes in machine loading or range gear position settings do not allow for return to the previous speed setting, the controller will attempt to return to the speed setting by sending either the maximum (fastest speed possible) or minimum (slowest speed possible) drive current to the transmission forward directional solenoid.

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Motion Match Switch:

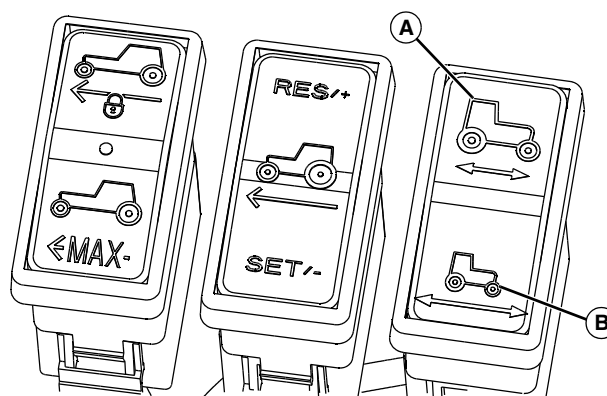
Motion Match enables the operator to adjust machine acceleration and deceleration rates.

Placing the motion match switch in the on position (A) will give the transmission higher response sensitivity to drive pedal movement. Shorter starting and stopping distances can be set for applications requiring rapid changes in direction, such as operating with a loader.

Placing the motion match switch in the off position (B) will give the drive pedals the sensitivity that is typical to most normal operating conditions. Longer starting and stopping distances can be set to avoid turf damage in other applications.

The motion match switch receives secondary switched power from the drive controller on 673A, 673E, and 673 Org wires.

When the motion match switch is in the on position (A), power is supplied from the 673 Org wire, across the

**A—On Position****B—Off Position**

motion match switch to the 269 Wht wire to the drive controller. This enables the motion match function for quicker acceleration and deceleration rates.

Continued on next page

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Load Match Switch (eHydro™ only):

Load match is used to eliminate operators stalling the engine during a typical application such as loader work. A throttle position sensor is installed to read the no-load engine rpm set point.

If the engine rpm drops far enough below the set point value, the current sent to the transmission drive valve coils is reduced to allow the engine to recover. The greater the load on the engine, the greater the reduction in current.

If cruise control is active and the load match comes on, the cruise speed output is held at whatever speed it is currently operating at until load match goes back to 100%.

The load match switch can be turned on or off to allow the operator to disable the load match function if desired.

The load match feature will have no effect if the machine is not being driven when the stalling load is being placed on the engine.

The load match switch receives power from the switched power circuit on 552A and 552E Red wires.

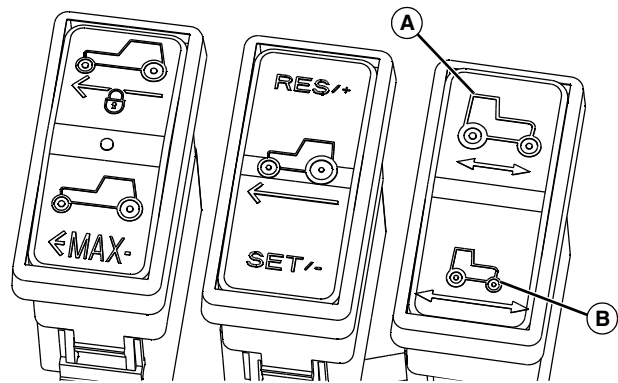
When the load match switch is in the on position (A), power is supplied from the 552E Red wire, across the load match switch to the 268 Gry wire to the drive controller. This enables the load match function to prevent the engine stalling during heavy load applications.

Drive Controller Inputs and Outputs (eHydro™)**Inputs:**

- Terminal A2 (267 Pur)—voltage in from the cruise/max speed switch, max speed on position.

NOTE: There is no power supplied to the HST controller when the key switch is in the START position. The reason for this is the controller needs to see a "neutral state" (drive pedals in the NEUTRAL position) immediately after power up.

- Terminal A3 (552A Red)—voltage in from the switched power circuit (key switch in accessory or run position) signals the drive controller. This power turns off when key switch is in the start position.
- Terminal B2 (265 Grn)—voltage in from the Res/ +, Set/—switch, Set/—position.
- Terminal B3 (238 Gry)—voltage in from the cruise/max speed switch, cruise control on position.
- Terminal C3 (269 Wht)—voltage in from the motion match switch, motion match on position.
- Terminal E1 (925 Grn)—provides input communication from the display panel to the drive controller.
- Terminal F1 (203 Org)—voltage in from the back up alarm (optional).
- Terminal F2 (686 Lt Blu)—voltage in from the forward pedal position sensor.
- Terminal F3 (325 Grn)—frequency in from the alternator, used to indicate the engine is running and for cruise control, max speed, load match, and motion match operation.

**A—On Position**

- Terminal G1 (247 Pur)—voltage in from the brake switch, right brake pedal depressed.
- Terminal G2 (499 Wht)—voltage in from the throttle position sensor.
- Terminal G3 (502 Red)—frequency in from the MFWD speed sensor.
- Terminal H1 (268 Gry)—voltage in from the load match switch, load match on position.
- Terminal H3 (687 Pur)—voltage in from the reverse pedal position sensor.
- Terminal J2 (266 Blu)—voltage in from the Res/ +, Set/—switch, Res/ + position.
- Terminal J3 (539 Wht)—voltage in from the seat switch, operator on seat.

Outputs:

- Terminal B1 (673A Org)—voltage out to the position sensors and motion match switch.
- Terminal H2 (924 Yel)—provides output communication to the display panel from the drive controller.
- Terminal K2 (696 Blu)—voltage out to the forward proportional solenoid.
- Terminal K3 (697 Pur)—voltage out to the reverse proportional solenoid.

Grounds:

- Terminal C2 (550A Blk)—ground in from the position sensors.
- Terminal E2 (050B Blk)—ground circuit for drive controller. Grounds back to frame ground through the X4 connector.

Forward Drive Circuit Operation

The forward drive circuit causes the electronic drive controller to propel the machine in a controlled forward direction.

Additionally the electronic drive controller provides for setting the following functions during a forward drive:

- Maximum travel speed
- Cruise control
- Motion match (pedal responsiveness)
- Load match

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Each of these additional functions has the ability to be turned on or off by the operator.

The electronic drive controller (drive controller) is a preprogrammed electrical device that allows the operator to control the machine forward drive function and speed via the electrical inputs from the forward foot pedal. Under normal operating conditions, this creates an output to the forward proportional solenoid in the transmission.

Current is supplied to the A2 drive controller from the two different switched power circuits.

With the key switch in the run or accessories position, current is supplied to the 212 Red wire, F11 fuse, 552 Red wire, X4 connector to the W9 wiring harness to the 552A and 552B Red wires and the A3 terminal of the X26 connector and the drive controller. This power supply is turned off when the key switch is in the start position.

These circuits power the drive controller to allow for drive control operation. The 673A Org wire splices to the 673B, 673C, 673D, 673E, and 673F Org wires to provide current from the drive controller to the throttle position sensor, forward pedal sensor, reverse pedal sensor, motion match switch (optional), and the MFWD speed sensor respectively.

When the forward pedal is pressed, current flows across the forward pedal potentiometer and back to the drive controller through the 686 Lt Blu wire. The drive controller then processes the voltage from this input command into an output command if the proper operating conditions exist. The output command (current) to the forward proportional solenoid is proportional to the pedal position.

The proper conditions for a forward function will be:

- 12.0 volt input on 552B Red wire, power on,
- 12.0 volt input on wire 539 Wht wire, operator on seat,
- 5.0 volt output on wire 673A Org wire, sensor power,
- Continuity to ground on 550A Blk wire, sensor ground,
- Continuity to ground on 050B Blk wire, drive controller ground,
- Voltage input on the 686 Lt Blu wire, forward pedal pressed,
- Frequency input on the 325 Grn wire, engine speed from the alternator,
- Voltage input on the 499 Wht wire, throttle position sensor,
- Frequency input on the 502 Red wire, MFWD speed sensor,
- Voltage input on the 687 Pur wire, reverse pedal not pressed,
- Current output up to 1800 mA on 696 Blu wire, forward proportional solenoid energized, and
- No current output on 697 Pur wire, reverse proportional solenoid not energized.

With the proper commands, the drive controller will ramp the output to the forward proportional solenoid to allow the machine to travel forward at a speed proportional to the position of the forward pedal, based upon the engine rpm and the range gear selected.

If at any time during the drive function the drive controller detects a problem with any of the input or output commands, the drive controller will provide output current on wire 924 Yel to the display panel. The LCD on the display panel will then display a fault code. This code can then be matched to the fault code chart to assist in the diagnosis of the problem.

Reverse Drive Circuit Operation

The reverse drive circuit causes the electronic drive controller to propel the machine in a controlled reverse direction.

Additionally the electronic drive controller provides for setting the following functions during a reverse drive:

- Maximum travel speed,
- Motion match (pedal responsiveness), and
- Load match.

Each of these additional functions has the ability to be turned on or off by the operator.

The electronic drive controller (drive controller) is a preprogrammed electrical device that allows the operator to control the machine reverse drive function and speed via the electrical inputs from the reverse foot pedal. Under normal operating conditions, this creates an output to the reverse proportional solenoid in the transmission.

Current is supplied to the A2 drive controller from the switched power circuit.

With the key switch in the run or accessories position, current is supplied to the 212 Red wire, F11 fuse, 552 Red wire, X4 connector to the W9 wiring harness to the 552A and 552B Red wires and the A3 terminal of the X26 connector and the drive controller. This power supply is turned off when the key switch is in the start position.

These circuits power the drive controller to allow for drive control operation. The 673A Org wire splices to the 673B, 673C, 673D, 673E and 673G Org wires to provide current from the drive controller to the throttle position sensor, forward pedal sensor, reverse pedal sensor, motion match switch (optional), and the MFWD speed sensor respectively.

When the reverse pedal is pressed, current flows across the reverse pedal potentiometer and back to the drive controller through the 687 Pur wire. The drive controller then processes the voltage from this input command into an output command if the proper operating conditions exist. The output command (current) to the reverse proportional solenoid is proportional to the pedal position.

The proper conditions for a reverse function will be:

- 12.0 volt input on wire 552B Red wire, power on,
- 12.0 volt input on wire 539 Wht wire, operator on seat,
- 5.0 volt output on wire 673A Org wire, sensor power,
- Continuity to ground on 550A Blk wire, sensor ground,
- Continuity to ground on 050B Blk wire, drive controller ground,

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- Voltage input on the 687 Pur wire, reverse pedal pressed,
- Frequency input on the 325 Grn wire, engine speed from the alternator,
- Frequency input on the 499 Wht wire, throttle position sensor,
- Frequency input on the 502 Red wire, MFWD speed sensor,
- Voltage input on the 686 Lt Blu wire, forward pedal not pressed,
- Current output up to 1800 mA on 697 Pur wire, reverse proportional solenoid energized, and
- No current output on 696 Blu wire, forward proportional solenoid not energized.

With the proper commands, the drive controller will ramp the output to the reverse proportional solenoid to allow the machine to travel reverse at a speed proportional to the position of the reverse pedal, based upon the engine rpm and the range gear selected.

If at any time during the drive function the drive controller detects a problem with any of the input or output commands, the drive controller will provide output current on wire 924 Yel to the display panel. The LCD on the

display panel will then display a fault code. This code can then be matched to the fault code chart to assist in the diagnosis of the problem.

Calibration—Manual:

Whenever a potentiometer is replaced or adjusted, manual calibration of the potentiometer is necessary. (See eHydro™/Auto HST Potentiometer Calibration Using Service ADVISOR™ in Section 40, Group 55.)

Calibration—Complete:

The complete calibration provides a means of resetting the HST control system back to factory specifications. (See eHydro™—Control System Complete Calibration Using Service ADVISOR™ in Section 40, Group 55.)

The complete calibration is necessary whenever one of the following has occurred:

- A proportional solenoid coil and/or valve has been replaced.
- The HST controller has been replaced.
- The hydro-static transmission (pump and motor assembly) has been replaced.

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eHydro™/Auto HST Potentiometer Calibration Using Service ADVISOR™

Reason:

The following potentiometers can be calibrated using Service ADVISOR™ diagnostic application:

- Forward Pedal Potentiometer
- Reverse Pedal Potentiometer (eHydro™ only)
- Throttle Position Potentiometer

Equipment:

- Service ADVISOR™ Diagnostic Application Software
- Computer
- DS10130 Transmission Control Unit (TCU) Cable

Service ADVISOR™ Connection Procedure:

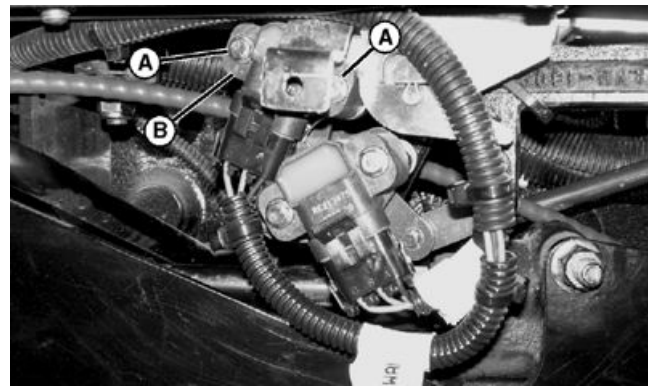
1. Connect computer to machine. (See [Service ADVISOR™ Connection Procedure](#) in Section 40, Group 55.)

2.

Forward Pedal Potentiometer Calibration:

1. Under the “Connection—Readings” tab, double-click on the following: “Forward Pedal Cal High (V)”, “Forward Pedal Cal Low (V)”, and “Forward Pedal Volts”. See [Adding and Removing Data Points](#), (see [Retrieving Diagnostic Trouble Codes with Service ADVISOR™ Diagnostic Application™](#) in Section 40, Group 55.)
2. With moderate force depress the forward/drive pedal to the Bottom Of Travel (BOT) position and then fully release the pedal to the Top Of Travel (TOT) position. When releasing the pedal, the pedal return spring must snap the pedal up to the TOT position while making a tapping sound. This will make sure that the pedal

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Readings Values:

Units: English

Trigger Status: Triggers are disabled or not active.

Reading Data Point	Value	Units	High	Low
TCU : Forward Pedal Cal High (V)	4.11	V	4.11	4.11
TCU : Forward Pedal Cal Low (V)	0.78	V	0.78	0.78
TCU : Forward Pedal Volts	0.78	V	0.78	0.78

A—Cap Screw (2 used)

B—Forward Pedal Potentiometer

is in the TOT position. Loosen cap screws (A) and rotate the potentiometer housing (B) until the “Forward Pedal Volts” value is within the Top Of Travel (TOT) specification. Tighten cap screws (A) and depress and release the forward/drive pedal. Verify the “Forward Pedal Volts” value is within the Top Of Travel (TOT) and Bottom of Travel (BOT) specifications.

3. Disconnect the forward/drive pedal potentiometer connector. The “Forward Pedal Volts” value changes to zero volts.

Readings Values:

Units: English

Trigger Status: Triggers are disabled or not active.

Reading Data Point	Value	Units	High	Low
TCU : Forward Pedal Cal High (V)	4.11	V	4.11	4.11
TCU : Forward Pedal Cal Low (V)	0.78	V	0.78	0.78
TCU : Forward Pedal Volts	0.00	V	0.96	0.0

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4. After 10 seconds, connect the forward/drive pedal potentiometer connector. The “Forward Pedal Cal High (V)” and “Forward Pedal Cal Low (V)” values change to zero, indicating the controller has erased the stored calibration values. Approximately 5 to 10 seconds after connecting the forward potentiometer connector, the controller stores the “Forward Pedal Cal Low (V)” value. Compare the “Forward Pedal Cal Low (V)” value with the “Forward Pedal Volts” value. The “Forward Pedal Cal Low (V)” value must be approximately the same as the “Forward Pedal Volts” value 0.2 volts.

Readings Values:				
Units:	Trigger Status:			
English	Triggers are disabled or not active.			
Reading Data Point	Value	Units	High	Low
TCU : Forward Pedal Cal High (V)	0.00	V	4.11	0.0
TCU : Forward Pedal Cal Low (V)	0.00	V	0.78	0.0
TCU : Forward Pedal Volts	0.78	V	0.96	0.0

Readings Values:				
Units:	Trigger Status:			
English	Triggers are disabled or not active.			
Reading Data Point	Value	Units	High	Low
TCU : Forward Pedal Cal High (V)	0.00	V	4.11	0.0
TCU : Forward Pedal Cal Low (V)	0.78	V	0.78	0.0
TCU : Forward Pedal Volts	0.78	V	0.96	0.0

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5. With a moderate amount of force, fully depress the forward/drive pedal to the Bottom Of Travel (BOT) position for approximately 5 to 10 seconds. The “Forward Pedal Cal High (V)” value changes from zero to the new value, indicating the controller stored the new value. With the forward pedal in the BOT position, compare the “Forward Pedal Cal High (V)” value with the “Forward Pedal Volts” value. The “Forward Pedal Cal High (V)” value must be approximately the same as the “Forward Pedal Volts” value 0.2 volts.
6. While observing the “Forward Pedal Volts” value, fully depress and release the forward/drive pedal. The “Forward Pedal Volts” value must within specifications when the pedal is at the TOT and BOT positions. If the values are not to specifications, test the forward/drive pedal potentiometer circuit. (See [eHydro™—Forward Drive Circuit Operation—Pre MY08](#) in Section 40, Group 35.) or (see [Auto HST—Forward Drive Circuit Operation](#) in Section 40, Group 35.)

Readings Values:				
Units:	Trigger Status:			
English	Triggers are disabled or not active.			
Reading Data Point	Value	Units	High	Low
TCU : Forward Pedal Cal High (V)	4.03	V	4.11	0.0
TCU : Forward Pedal Cal Low (V)	0.78	V	0.78	0.0
TCU : Forward Pedal Volts	4.04	V	4.08	0.0

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TOT Position	
Signal—Voltage.....	0.6—0.9 volts
BOT Position	
Signal—Voltage.....	2.7—3.5 volts greater than TOT position signal voltage
Lock Nut— Torque.....	5 N·m (44.25 lb-in.)

Forward Pedal Potentiometers Test—Specification

Input—Voltage.....5.0 ± 0.2 volts

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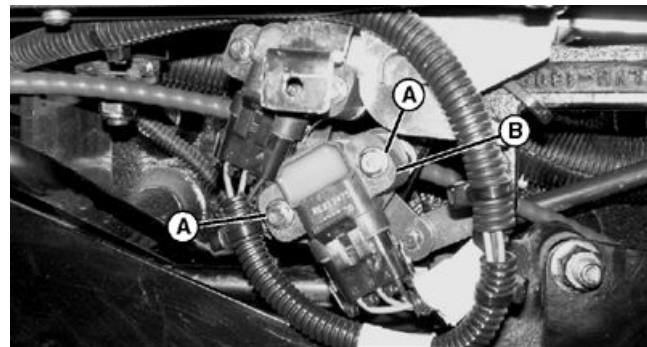
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Reverse Pedal Potentiometer Calibration (eHydro™ only):

1. Under the “Connection—Readings” tab, double-click on the following: “Reverse Pedal Cal High (V)”, “Reverse Pedal Cal Low (V)”, and “Reverse Pedal Volts”. See Adding and Removing Data Points, (see Retrieving Diagnostic Trouble Codes with Service ADVISOR™ Diagnostic Application™ in Section 40, Group 55.)
2. Depress the reverse pedal and then fully release the pedal to the Top Of Travel (TOT) position. When releasing the pedal, the pedal return spring must snap the pedal up to the TOT position while making a tapping sound. This will make sure that the pedal is in the TOT position. Loosen cap screws (A) and rotate the potentiometer housing (B) until the “Reverse Pedal Volts” value is within the Top Of Travel (TOT) specification. Tighten cap screws (A) and depress and release the reverse pedal. Verify the “Reverse Pedal Volts” value is within the Top Of Travel (TOT) and Bottom Of Travel (BOT) specifications.

A—Cap Screw (2 used)

B—Reverse Pedal Potentiometer



Readings Values:

Units: English Trigger Status: Triggers are disabled or not active.

Reading Data Point	Value	Units	High	Low
TCU : Reverse Pedal Cal High (V)	4.05	V	4.05	4.05
TCU : Reverse Pedal Cal Low (V)	0.76	V	0.76	0.76
TCU : Reverse Pedal Volts	0.76	V	0.76	0.76

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3. Disconnect the reverse pedal potentiometer connector. The “Reverse Pedal Volts” value changes to zero volts.

Readings Values:

Units: English Trigger Status: Triggers are disabled or not active.

Reading Data Point	Value	Units	High	Low
TCU : Reverse Pedal Cal High (V)	4.05	V	4.05	4.05
TCU : Reverse Pedal Cal Low (V)	0.76	V	0.76	0.76
TCU : Reverse Pedal Volts	0.00	V	0.76	0.0

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4. After 10 seconds, connect the reverse potentiometer connector. The “Reverse Pedal Cal High (V)” and “Reverse Pedal Cal Low (V)” values change to zero, indicating the controller has erased the stored calibration values. Approximately 5 to 10 seconds after connecting the reverse potentiometer connector, the controller stores the “Reverse Pedal Cal Low (V)” value. Compare the “Reverse Pedal Cal Low (V)” value with the “Reverse Pedal Volts” value. The “Reverse Pedal Cal Low (V)” value must be approximately the same as the “Reverse Pedal Volts” value 0.2 volts.

Readings Values:				
Units:	Trigger Status:			
English	Triggers are disabled or not active.			
Reading Data Point	Value	Units	High	Low
TCU : Reverse Pedal Cal High (V)	0.00	V	4.05	0.0
TCU : Reverse Pedal Cal Low (V)	0.00	V	0.76	0.0
TCU : Reverse Pedal Volts	0.76	V	0.78	0.0

Readings Values:				
Units:	Trigger Status:			
English	Triggers are disabled or not active.			
Reading Data Point	Value	Units	High	Low
TCU : Reverse Pedal Cal High (V)	0.00	V	4.05	0.0
TCU : Reverse Pedal Cal Low (V)	0.78	V	0.78	0.0
TCU : Reverse Pedal Volts	0.78	V	0.78	0.0

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5. With a moderate amount of force, fully depress the reverse pedal to the Bottom Of Travel (BOT) position for approximately 5 to 10 seconds. The “Reverse Pedal Cal High (V)” value changes from zero to the new value, indicating the controller stored the new value. With the reverse pedal in the BOT position, compare the “Reverse Pedal Cal High (V)” value with the “Reverse Pedal Volts” value. The “Reverse Pedal Cal High (V)” value must be approximately the same as the “Reverse Pedal Volts” value 0.2 volts.
6. While observing the “Reverse Pedal Volts” value, fully depress and release the reverse pedal. The “Reverse Pedal Volts” value must within specifications when the pedal is at the TOT and BOT positions. If the values are not to specifications, test the reverse pedal potentiometer circuit. (See eHydro™—Reverse Drive Circuit Operation—Pre MY08 in Section 40, Group 35.)

Readings Values:				
Units:	Trigger Status:			
English	Triggers are disabled or not active.			
Reading Data Point	Value	Units	High	Low
TCU : Reverse Pedal Cal High (V)	4.07	V	4.07	0.0
TCU : Reverse Pedal Cal Low (V)	0.78	V	0.78	0.0
TCU : Reverse Pedal Volts	4.06	V	4.1	0.0

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TOT Position	
Signal—Voltage.....	0.6—0.9 volts
BOT Position	
Signal—Voltage.....	2.7—3.5 volts greater than TOT position signal voltage
Lock Nut—Torque.....	5 N·m (44.25 lb-in.)

Reverse Pedal Potentiometers Test—Specification

Input—Voltage..... 5.0 ± 0.2 volts

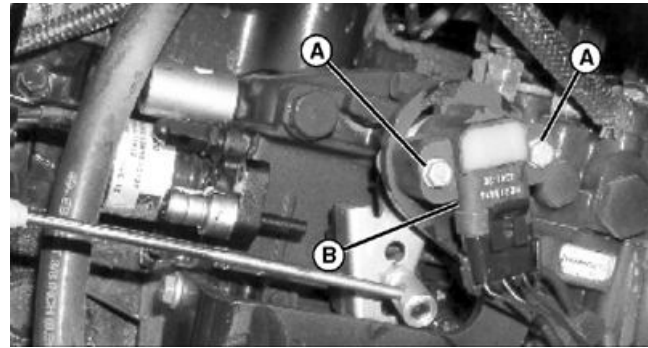
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Throttle Position Potentiometer Calibration:

1. Under the “Connection—Readings” tab, double-click on the following: “Throttle Sensor Cal High (V)”, “Throttle Sensor Cal Low (V)”, and “Throttle Sensor Volts”. See Adding and Removing Data Points, (see Retrieving Diagnostic Trouble Codes with Service ADVISOR™ Diagnostic Application™ in Section 40, Group 55.)
2. Move the throttle lever between the fast and slow idle positions to make sure that the lever is fully in the slow idle position. Loosen cap screws (A) and rotate the potentiometer housing (B) until the “Throttle Sensor Volts” value is within the slow idle position signal voltage specification. Tighten cap screws (A) and cycle the throttle lever between the fast and slow idle positions. Verify the “Throttle Sensor Volts” value is within the slow and fast idle position signal voltage specifications.

A—Cap Screws (2 used)

B—Throttle Position
Potentiometer Calibration

Readings Values:

Units: English Trigger Status: Triggers are disabled or not active.

Reading Data Point	Value	Units	High	Low
TCU : Throttle Sensor Cal High (V)	3.54	V	3.54	3.54
TCU : Throttle Sensor Cal Low (V)	0.94	V	0.94	0.94
TCU : Throttle Sensor Volts	0.84	V	0.86	0.84

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3. Move the throttle lever to the slow idle position. Disconnect the throttle position potentiometer connector. The “Throttle Sensor Volts” value changes to zero volts.

Readings Values:

Units: English Trigger Status: Triggers are disabled or not active.

Reading Data Point	Value	Units	High	Low
TCU : Throttle Sensor Cal High (V)	3.54	V	3.54	3.54
TCU : Throttle Sensor Cal Low (V)	0.94	V	0.94	0.94
TCU : Throttle Sensor Volts	0.00	V	0.86	0.0

LVAL11799—UN—02NOV10

Continued on next page

KN52281,10044B9 -19-02NOV12-10/12

4. After 10 seconds, connect the throttle position potentiometer connector. The “Throttle Sensor Cal High (V)” and “Throttle Sensor Cal Low (V)” values change to zero, indicating the controller has erased the stored calibration values. Approximately 5 to 10 seconds after connecting the throttle position potentiometer connector, the controller stores the “Throttle Sensor Cal Low (V)” value. Compare the “Throttle Sensor Cal Low (V)” value with the “Throttle Sensor Volts” value. The “Throttle Sensor Cal Low (V)” value must be approximately the same as the “Throttle Sensor Volts” value 0.2 volts.

Readings Values:				
Units:		Trigger Status:		
English		Triggers are disabled or not active.		
Reading Data Point	Value	Units	High	Low
TCU : Throttle Sensor Cal High (V)	0.00	V	3.54	0.0
TCU : Throttle Sensor Cal Low (V)	0.00	V	0.94	0.0
TCU : Throttle Sensor Volts	0.84	V	0.86	0.0

Readings Values:				
Units:		Trigger Status:		
English		Triggers are disabled or not active.		
Reading Data Point	Value	Units	High	Low
TCU : Throttle Sensor Cal High (V)	0.00	V	3.54	0.0
TCU : Throttle Sensor Cal Low (V)	0.84	V	0.94	0.0
TCU : Throttle Sensor Volts	0.84	V	0.86	0.0

LVAL11800 —UN—02NOV10

LVAL11801 —UN—02NOV10

KN52281,10044B9 -19-02NOV12-11/12

5. While observing the “Throttle Sensor Cal High (V)” value, at a moderate and force, rate move the throttle lever to the fast idle position for 10 seconds. The “Throttle Sensor Cal High (V)” value changes from zero to the new value, indicating the controller stored the new value. With the throttle lever at the maximum speed position, compare the “Throttle Sensor Cal High (V)” value with the “Throttle Sensor Volts” value. The “Throttle Sensor Cal High (V)” value must be approximately the same as the “Throttle Sensor Volts” value 0.2 volts.

Readings Values:				
Units:		Trigger Status:		
English		Triggers are disabled or not active.		
Reading Data Point	Value	Units	High	Low
TCU : Throttle Sensor Cal High (V)	3.54	V	3.54	0.0
TCU : Throttle Sensor Cal Low (V)	0.84	V	0.94	0.0
TCU : Throttle Sensor Volts	3.55	V	3.55	0.0

LVAL11802 —UN—02NOV10

6. While observing the “Throttle Sensor Volts” value, move the throttle lever between the slow and fast idle positions. The “Throttle Sensor Volts” value must within specifications when the lever is at the slow and fast idle positions. If the values are not to specifications, test the throttle position potentiometer circuit.

Slow Idle Position		
Signal—Voltage.....	0.7—0.9 volts	
Fast Idle Position		
Signal—Voltage.....	2.0—3.7 volts greater than	
	slow idle position signal voltage	

Throttle Position Potentiometer—Specification

Input—Voltage..... 5.0 ± 0.2 volts

KN52281,10044B9 -19-02NOV12-12/12

eHydro™—Control System Complete Calibration Using Service ADVISOR™

Reason:

NOTE: Only perform this procedure under the following conditions:

To calibrate the HST control system when the following conditions exist:

- Proportional solenoid coil has been replaced.
- Proportional solenoid valve has been replaced.
- HST controller has been replaced.
- The hydro-static transmission (pump and motor assembly) has been replaced.
- Complete calibration was attempted and failed. (See eHydro™—Forward and Reverse Threshold Calibration in Section 40, Group 55.)

The complete calibration procedure provides a means of resetting the HST control system to the factory specifications.

Test Conditions:

- Machine on jack stands.
- Operator ON seat.
- Range selector lever in NEUTRAL position.
- Park brake unlocked.
- MFWD disengaged.
- Engine RUNNING with throttle at slow idle.

Procedure:

IMPORTANT: Avoid Damage! The fast idle and torque capsule adjustments are pre-set by the engine manufacturer to comply with strict EPA/CARB emissions requirements, and are only adjustable by an authorized service facility. DO NOT remove or adjust these components. Tampering with

the fast idle and torque capsule adjustments may result in severe fines or penalties.

NOTE: Entering the calibration mode resets all controller values to zero. Because of this, the calibration process must be completed before machine can be driven. If a complete system calibration was attempted and failed or was interrupted, machine movement may be lost. To regain movement for complete system calibration, (see eHydro™—Forward and Reverse Threshold Calibration

1. Verify that the engine slow idle speed is set properly. (See Slow Idle Adjustment in Section 03, Group 05.). Verify engine fast idle speed is 2810 ± 25 before performing the HST calibration procedure.

⚠ CAUTION: Avoid Injury! Position machine safely on jack stands so that all four wheels spin freely. Make sure that all persons and objects are clear of the wheels during calibration procedure.

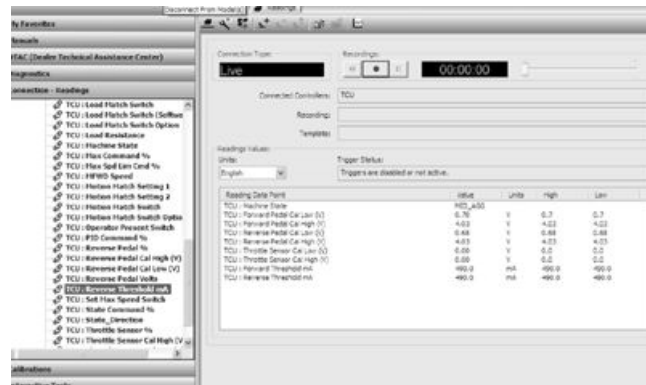
2. Install jack stands under machine so that all wheels are off the ground and are free to spin.

NOTE: The engine must run during the whole calibration routine. For the calibration of the drive pedals, the engine speed should be set to slow idle. For forward and reverse thresholds, the engine MUST be at high idle. Wait approximately 5 seconds between each test.

3. Start and run the engine at slow idle.
4. Connect computer to machine. (See Service ADVISOR™ Connection Procedure in Section 40, Group 55.)

5. Under the “Connection—Readings” tab, double-click on the following readings options:

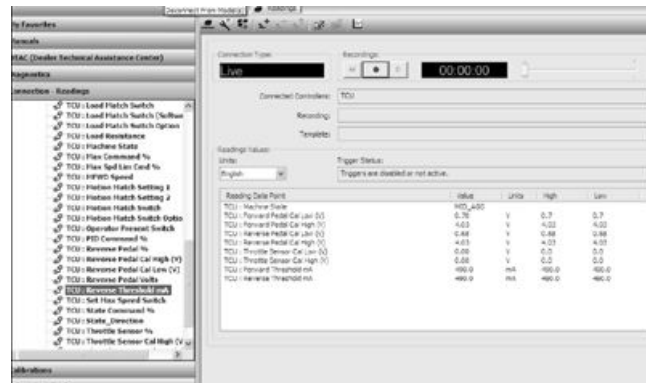
- “Machine State”
- “Forward Pedal Cal Low (V)”
- “Forward Pedal Cal High (V)”
- “Reverse Pedal Cal Low (V)”
- “Reverse Pedal Cal High (V)”
- “Throttle Sensor Cal Low (V)”
- “Throttle Sensor Cal High (V)”
- “Forward Threshold mA”
- “Reverse Threshold mA”



KN52281,10044BA -19-02NOV12-2/3

LVAL11803—UN—02NOV10

6. When “Machine State” value indicates “CAL_FWD”, wait 5 seconds, then gradually but smoothly depress the forward pedal to the Bottom Of Travel (BOT) position until the controller records the new “Forward Pedal Cal High (V)” value. Release pedal.
7. When “Machine State” value indicates “CAL_RVS”, wait 5 seconds, then gradually but smoothly depress the reverse pedal to the Bottom Of Travel (BOT) position until the controller records the new “Reverse Pedal Cal High (V)” value. Release pedal.
8. When “Machine State” value indicates “CAL_TPS”, wait 5 seconds, then move the throttle lever to the fast idle position until the controller records the new “Throttle Sensor Cal High (V)” value. Leave the throttle lever in the fast idle position and proceed to the next step.
9. When “Machine State” value indicates “CAL_FVL”, fully depress the forward pedal until the controller records the new “Forward Threshold mA” value (approximately 20—30 seconds). Release the forward pedal to the Top Of Travel (TOT) position.
10. When “Machine State” value indicates “CAL_RVL”, fully depress the reverse pedal until the controller



records the new “Reverse Threshold mA” value. Release the reverse pedal to the Top Of Travel (TOT) position and move the throttle lever to the slow idle position.

11. Machine state value should change to “Run_Mode” and the machine should be fully operational.

KN52281,10044BA -19-02NOV12-3/3

LVAL11804—UN—02NOV10

Auto HST—Control System Complete Calibration Using Service ADVISOR™

Reason:

NOTE: Only perform this procedure under the following conditions:

To calibrate the Auto-HST control system when one or more of the following conditions exist:

- Proportional solenoid coil has been replaced.
- Proportional solenoid valve has been replaced.
- HST controller has been replaced.
- The hydro-static transmission (pump and motor assembly) has been replaced.
- Complete calibration was attempted and failed.

The complete calibration procedure provides a means of resetting the Auto-HST control system to the factory specifications.

Test Conditions:

- Machine on jack stands.
- Operator ON seat.
- Range selector lever in “A” position.
- Park brake unlocked.
- MFWD disengaged.
- FNR in neutral position.
- Engine RUNNING with hand throttle at slow idle.
- Drive pedal released

Procedure:

IMPORTANT: Avoid Damage! The fast idle and torque capsule adjustments are pre-set by the engine manufacturer to comply with strict EPA/CARB emissions requirements, and are only adjustable by an authorized service facility. DO NOT remove or adjust these components. Tampering with the fast idle and torque capsule adjustments may result in severe fines or penalties.

NOTE: Entering the calibration mode resets all controller values to zero. Because of this, the calibration process must be completed before machine can be driven. If a complete system calibration was attempted and failed or was interrupted, machine movement may be lost.

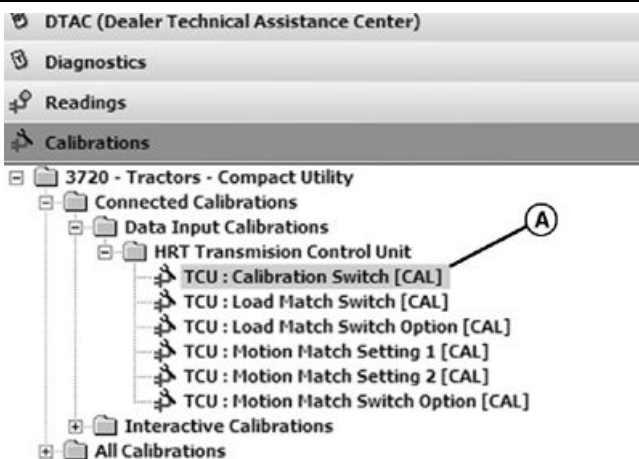
1. Verify that the engine slow idle speed is set properly. (See Slow Idle Adjustment in Section 03, Group 05.) Verify engine fast idle speed is 2810 ± 25 before performing the Auto-HST calibration procedure.
2. Disconnect drive pedal throttle cable. (See Throttle Cable Replacement/Adjustment (Auto HST) in Section 120, Group 10.)

⚠ CAUTION: Avoid Injury! Position machine safely on jack stands so that all four wheels spin freely. Make sure that all persons and objects are clear of the wheels during calibration procedure.

3. Install jack stands under machine so that all wheels are off the ground and are free to spin.

NOTE: The engine must run during the whole calibration routine. Wait approximately 5 seconds between each test.

4. Start and run the engine at slow idle.
5. Connect computer to machine. (See Service ADVISOR™ Connection Procedure in Section 40, Group 55.) for TCU.
6. Under the “Calibrations” tab, navigate to the “Calibration Switch [CAL] switch as shown (A). Double click on “Calibration Switch [CAL]”. A new dialog box will open.



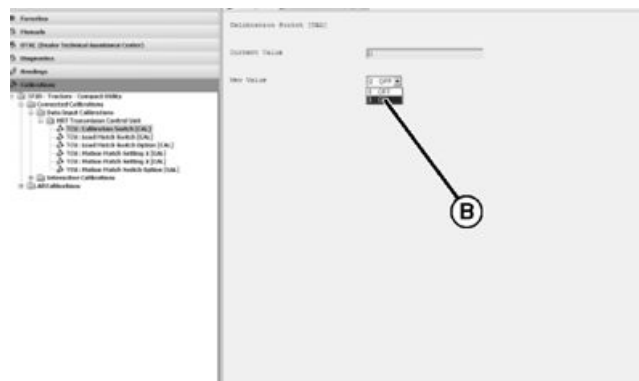
A—Calibration Switch [CAL]

LVAL11805—UN—02NOV10

KN52281,10044BB -19-02NOV12-2/4

- Change the value (B) from “0” to “3” and click “Send” and confirm that the “Current Value” changes, then click “Exit”.

B—Value



LVAL11806—UN—02NOV10

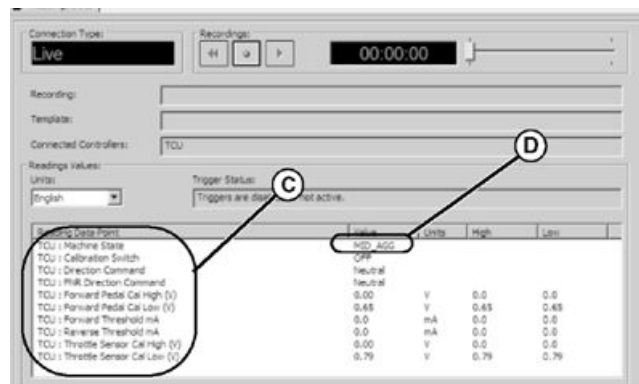
Continued on next page

KN52281,10044BB -19-02NOV12-3/4

8. Under the “Readings” tab, double-click on the following readings options (C):

- “Machine State”
- “Forward Pedal Cal Low (V)”
- “Forward Pedal Cal High (V)”
- “FNR Direction Command”
- “Throttle Sensor Cal Low (V)”
- “Throttle Sensor Cal High (V)”
- “Forward Threshold mA”
- “Reverse Threshold mA”

9. Note the value of the “Machine State” parameter (D). If it reads “MID_AGG”, wait for it to toggle to “CAL_MODE”. If it does not toggle after a few seconds, ensure that the “Calibration Switch [CAL]” value is set to “3”. If not, repeat step 6.
10. When “Machine State” value indicates “CAL_FWD”, wait 5 seconds, then gradually but smoothly depress the forward pedal to the Bottom Of Travel (BOT) position until the controller records the new “Forward Pedal Cal High (V)” value. Release pedal.
11. When “Machine State” value indicates “CAL_FNR”, wait 5 seconds, then place the FNR lever in the forward position, wait 5 seconds, then return to neutral. After 5 seconds, place the switch in the reverse position and wait 5 seconds. Then return the FNR to the neutral position.
12. When “Machine State” value indicates “CAL_TPS”, wait 5 seconds, then move the hand throttle lever to the fast idle position with a moderate amount of force.
13. When “Machine State” value indicates “CAL_FVL”, place the FNR lever in the forward position and fully depress the drive pedal until Service ADVISOR™ records the new “Forward Threshold mA” value (approximately 20—30 seconds). Release the drive pedal to the Top Of Travel (TOT) position.
14. When “Machine State” value indicates “CAL_RVL”, place the FNR switch in the reverse position and fully



C—Reading Options

D—Machine State Parameter

depress the drive pedal until Service ADVISOR™ records the new “Reverse Threshold mA” value (approximately 20—30 seconds). Release the drive pedal to the Top Of Travel (TOT) position and move the throttle lever to the slow idle position.

15. “Machine State” value should change to “Run_Mode” and the machine should be fully operational.
16. Clear and refresh error codes screen.
17. Check for any active error codes.
18. No error codes related to calibration should exist. If any are present troubleshoot or repeat calibration procedure.
19. Turn key switch to off.
20. Reconnect drive pedal throttle cable. (See [Throttle Cable Replacement/Adjustment \(Auto HST\)](#) in Section 120, Group 10.)
21. Restart machine and check for proper drive.

KN52281,10044BB -19-02NOV12-4/4

eHydro™—Forward and Reverse Threshold Calibration

Reason:

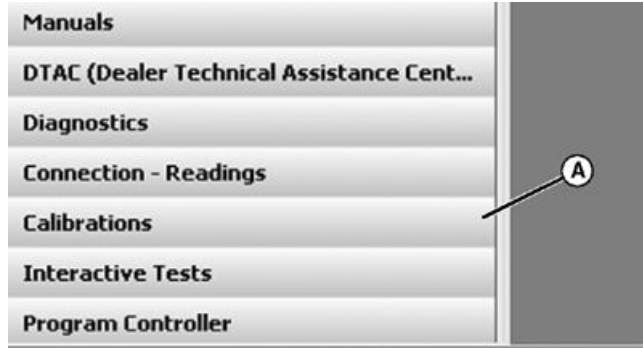
HST control system complete calibration was attempted and failed. Now the transmission will not move the machine in forward or reverse direction and there are multiple diagnostic trouble codes (DTCs), including “DTC—12 Valve Output to Forward or Reverse Solenoid Coil”.

NOTE: The following procedure is intended to allow machine operation for testing purposes only. After isolating and correcting the problem, full machine calibration must be performed. (See eHydro™—Control System Complete Calibration Using Service ADVISOR™ in Section 40, Group 55.)

Procedure:

1. Connect computer to machine. (See Service ADVISOR™ Connection Procedure in Section 40, Group 55.)
2. The following potentiometers must be calibrated before performing this procedure:
 - Forward Pedal. Follow Forward Pedal Potentiometer Calibration: (See eHydro™/Auto HST Potentiometer Calibration Using Service ADVISOR™ in Section 40, Group 55.)
 - Reverse Pedal. Follow Reverse Pedal Potentiometer Calibration (eHydro™ only): (See eHydro™/Auto HST Potentiometer Calibration Using Service ADVISOR™ in Section 40, Group 55.)
 - Throttle Position. Follow Throttle Position Potentiometer Calibration: (See eHydro™/Auto HST Potentiometer Calibration Using Service ADVISOR™ in Section 40, Group 55.)
3. Turn the key switch to the RUN position.
4. Start Service ADVISOR™ Diagnostic Software.
5. Click on the “Calibrations” tab (A).

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For Reference Only, Service ADVISOR™ Screen Captures May Vary

A—Calibrations Tab

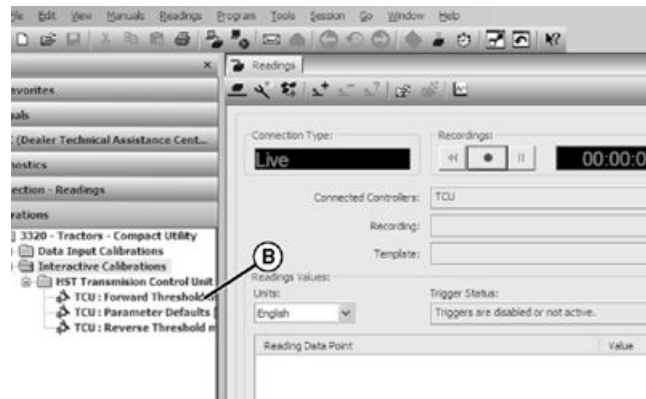
LVAL11808—JUN—02NOV10

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KN52281,10044BC -19-02NOV12-1/5

6. Under the “Calibrations” tab, expand the folder for the machine attached to Service ADVISOR™ Model 3320 shown.
7. Expand the “Interactive Calibrations” folder and then the “HST Transmission Control Unit” folder.
8. Double-click on “TCU: Forward Threshold mA [CAL]” parameter (B).

**B—TCU: Forward Threshold
mA [CAL]**



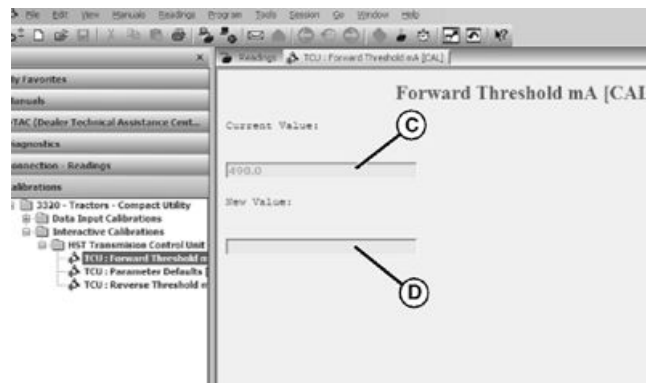
LVAL11809 —UN—02NOV10

KN52281,10044BC -19-02NOV12-2/5

9. View the readings if any in the “Current Value” (C) and “New Value” (D) boxes.
 - a. If the “Current Value” box (C) is not set to zero do not proceed. A value other than zero indicates the forward threshold value has already been calibrated. Click on the “Exit” button and continue at step 9.
 - b. If the “Current Value” box is set to zero, then in the “New Value” box (D) enter the value of 325. Click on the “Send” button. When prompted to confirm the request, click on the “Yes” button and then click on the “Exit” button.

C—Current Value

D—New Value

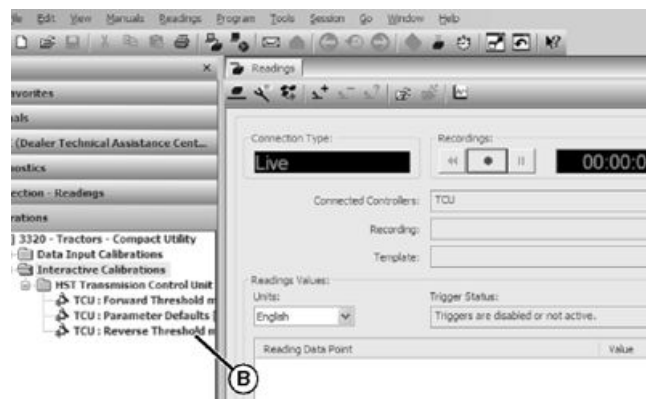


LVAL11810 —UN—02NOV10

KN52281,10044BC -19-02NOV12-3/5

10. Double-click on “TCU: Reverse Threshold mA [CAL]” parameter (E).

**B—TCU: Reverse Threshold
mA [CAL]” Parameter**



LVAL11811 —UN—02NOV10

Continued on next page

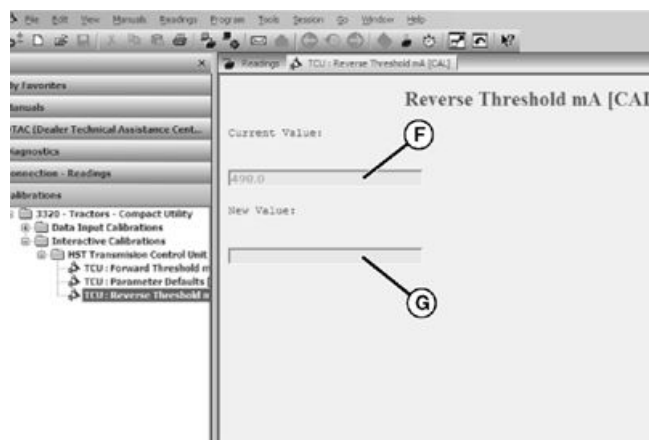
KN52281,10044BC -19-02NOV12-4/5

11. View the readings if any in the “Current Value” (F) and “New Value” (G) boxes.

- a. If the “Current Value” box (F) is not set to zero do not proceed. A value other than zero indicates the forward threshold value has already been calibrated. Click on the “Exit” button and continue at step 12.
- b. If the “Current Value” box is set to zero, then in the “New Value” box (G) enter the value of 325. Click on the “Send” button. When prompted to confirm the request, click on the “Yes” button and then click on the “Exit” button.

12. The controller will now accept commands to move the transmission. Continue to isolate the calibration problem. (See [eHydro™—Forward Drive Circuit Operation—Pre MY08](#) in Section 40, Group 35.) and (see [eHydro™—Reverse Drive Circuit Operation—Pre MY08](#) in Section 40, Group 35.)

NOTE: After isolating and correcting the problem, full machine calibration must be performed. (See [eHydro™—Control System Complete Calibration Using Service ADVISOR™](#) in Section 40, Group 55.)



F—Current Value Box

G—New Value Box

LVAL11812—UN—02NOV10

KN52281,10044BC -19-02NOV12-5/5

Auto HST—Forward and Reverse Threshold Calibration

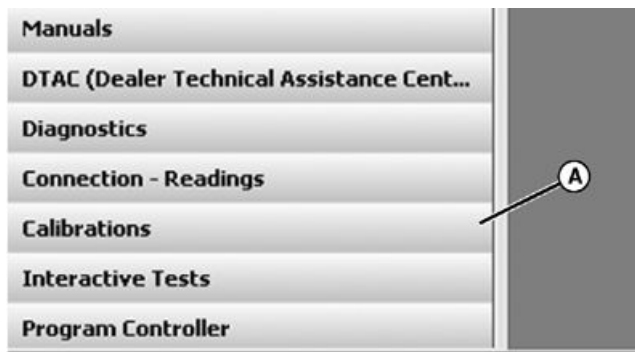
Reason:

HST control system complete calibration was attempted and failed. Now the transmission will not move the machine in forward or reverse direction and there are multiple diagnostic trouble codes (DTCs), including “DTC—12 Valve Output to Forward or Reverse Solenoid Coil”.

NOTE: The following procedure is intended to allow machine operation for testing purposes only. After isolating and correcting the problem, full machine calibration must be performed. (See Auto HST—Electronic Drive Controller System Calibration in Section 40, Group 45.)

Procedure:

1. Connect computer to machine. (See Service ADVISOR™ Connection Procedure in Section 40, Group 55.)
2. The following potentiometers must be calibrated before performing this procedure:
 - Forward Pedal. Follow Forward Pedal Potentiometer Calibration: (See eHydro™/Auto HST Potentiometer Calibration Using Service ADVISOR™ in Section 40, Group 55.)
 - Throttle Position. Follow Throttle Position Potentiometer Calibration: (See eHydro™/Auto HST Potentiometer Calibration Using Service ADVISOR™ in Section 40, Group 55.)
3. Turn the key switch to the RUN position.
4. Start Service ADVISOR™ Diagnostic Software.
5. Click on the “Calibrations” tab (A).



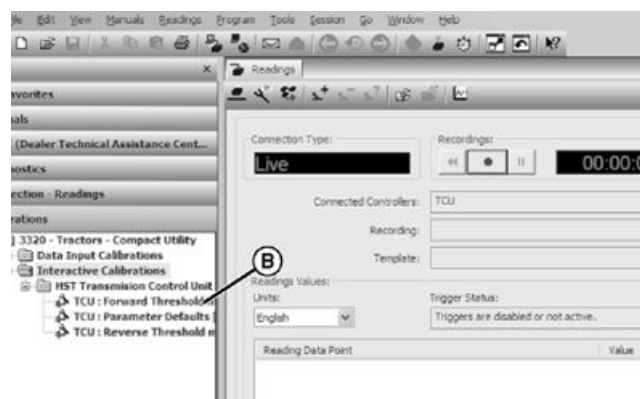
For Reference Only, Service ADVISOR™ (screen captures may vary)

A—Calibrations Tab

LVAL11813 —UN—02NOV10

6. Under the “Calibrations” tab, expand the folder for the machine attached to Service ADVISOR™. Model 3320 shown.
7. Expand the “Interactive Calibrations” folder and then the “HST Transmission Control Unit” folder.
8. Double-click on “TCU: Forward Threshold mA [CAL]” parameter (B).

B—TCU: Forward Threshold
mA [CAL]” Parameter



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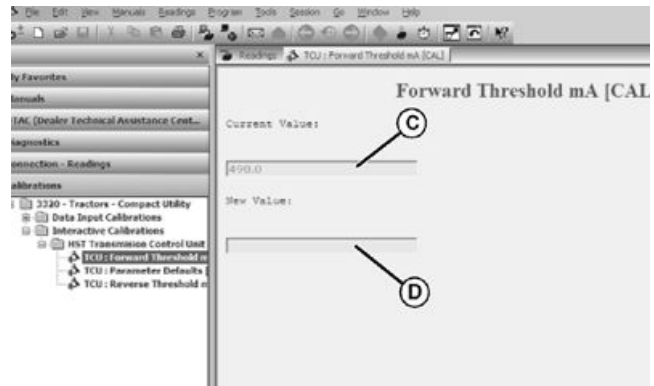
KN52281,10044BD -19-02NOV12-1/5

KN52281,10044BD -19-02NOV12-2/5

LVAL11814 —UN—02NOV10

9. View the readings if any in the “Current Value” (C) and “New Value” (D) boxes.

- If the “Current Value” box (C) is not set to zero do not proceed. A value other than zero indicates the forward threshold value has already been calibrated. Click on the “Exit” button and continue at step 9.
- If the “Current Value” box is set to zero, then in the “New Value” box (D) enter the value of 325. Click on the “Send” button. When prompted to confirm the request, click on the “Yes” button and then click on the “Exit” button.



LVAL11815 —UN—02NOV10

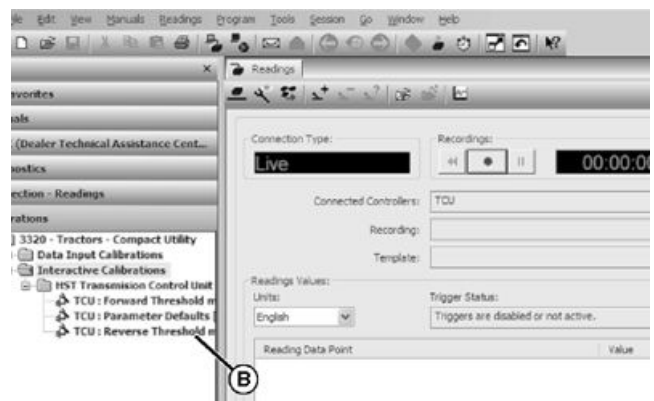
C—Current Value Box

D—New Value Box

KN52281,10044BD -19-02NOV12-3/5

10. Double-click on “TCU: Reverse Threshold mA [CAL]” parameter (E).

**B—TCU: Reverse Threshold
mA [CAL]” Parameter**

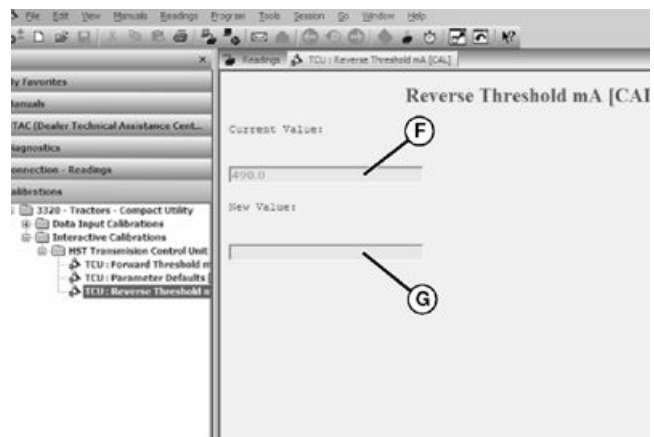


LVAL11816 —UN—02NOV10

KN52281,10044BD -19-02NOV12-4/5

11. View the readings if any in the “Current Value” (F) and “New Value” (G) boxes.

- If the “Current Value” box (F) is not set to zero do not proceed. A value other than zero indicates the forward threshold value has already been calibrated. Click on the “Exit” button and continue at step 12.
- If the “Current Value” box is set to zero, then in the “New Value” box (G) enter the value of 325. Click on the “Send” button. When prompted to confirm the request, click on the “Yes” button and then click on the “Exit” button.



LVAL11817 —UN—02NOV10

F—Current Value Box

G—New value Box

12. The controller will now accept commands to move the transmission. Continue to isolate the calibration problem. (See [Auto HST—Forward Drive Circuit Operation](#) in Section 40, Group 35.) and see [Auto HST—Reverse Drive Circuit Operation](#) in Section 40, Group 35.)

NOTE: After isolating and correcting the problem, full machine calibration must be performed. (See [eHydro™—Control System Complete Calibration Using Service ADVISOR™](#) in Section 40, Group 55.)

KN52281,10044BD -19-02NOV12-5/5

Controller Reprogramming

Reason:

To update or restore software in the TCU (Transmission Control Unit) or ICC (Instrument Cluster Controller).

Equipment:

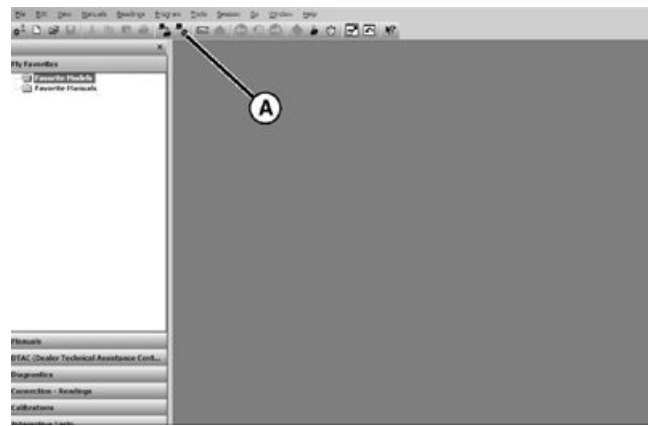
NOTE: An Internet connection is only necessary in order to download the controller software. After this is accomplished, the Internet connection is no longer required.

- PC compatible computer with Internet connection
- Service ADVISOR™ software (Confirm that the newest version is being used)
- DS10130 Transmission Control Unit (TCU) Cable

Procedure:

1. Connect computer to machine. (See [Service ADVISOR™ Connection Procedure](#) in Section 40, Group 55.)
2. Open the Service ADVISOR™ application.
3. Method A—Click on the “Connect to Deere Network” icon (A).

Service ADVISOR is a trademark of Deere & Company



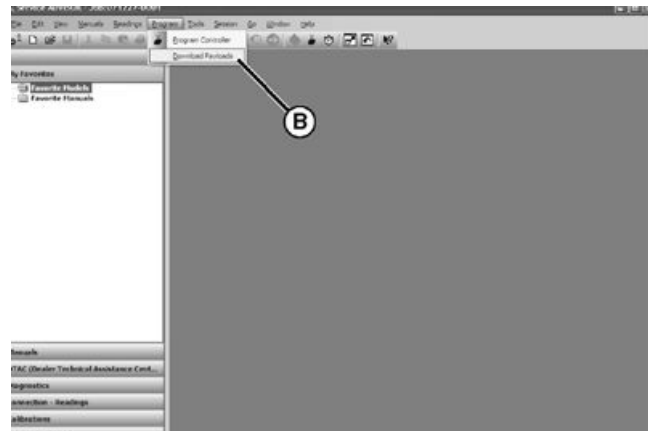
**A—Connect to Deere Network”
Icon**

LVAL11818—UN—02NOV10

KN52281,10044BE -19-02NOV12-1/12

4. Method B—Click on “Program” and then “Download Payloads” (B).
5. Enter a valid Deere RACF id and password.
6. Click “OK”.

B—Download Payloads



Continued on next page

LVAL11819—UN—02NOV10

KN52281,10044BE -19-02NOV12-2/12

7. If prompted with the Java Plug-In Security Warning (C):

NOTE: It is preferred to click “Always trust content from this publisher”.

- “Run”—Will allow the user to log on for this session
- “Cancel”—Will not allow the user access
- “Always trust content from this publisher”—Will allow the user to connect without being prompted for this message.
- “More information”—Will allow the user to access the Certificate Properties that might be valuable for troubleshooting

NOTE: The license renewal will only appear if your renewal date is within one month of renewal. The system will automatically renew your license for you.

8. If prompted with the Service ADVISOR™ license renewal, click “OK”.
9. Method A Only—A new browser window will open to the Dealer Pathway—Service section.



C—Java Plug-In Security Warning

KN52281,10044BE -19-02NOV12-3/12

10. Method A Only—Click on “John Deere Custom Performance (Software Delivery System)” (D).

D—John Deere Custom Performance (Software Delivery System)



Continued on next page

KN52281,10044BE -19-02NOV12-4/12

11. Users can now access software for controllers through two different search options:

- Serial Number Search (E)—Allows users to search for a specific or generic Product Identification Number (PIN) or Engine Serial Number (ESN) payload file.
- PIP Number Search (F)—Allows users to search for a specific Product Improvement Program (PIP) number.

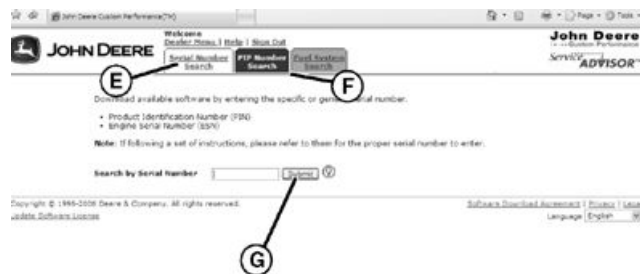
12. Enter the PIN, ESN or PIP and click “Submit” (G).

13. If prompted with the Java Plug-In Security Warning:

NOTE: It is preferred to click “Always trust content from this publisher”.

- “Run”—Will allow the user to log on for this session
- “Cancel”—Will not allow the user access
- “Always trust content from this publisher”—Will allow the user to connect without being prompted for this message
- “More information”—Will allow the user to access the Certificate Properties that might be valuable for troubleshooting

NOTE: The license renewal will only appear if your renewal date is within one month of renewal. The system will automatically renew your license for you.



E—Serial Number Search
F—PIP Number Search

G—Submit

14. If prompted with the Service ADVISOR™ license renewal, click “OK”.

15. The system will check for a valid license. If a valid license is verified successfully, the user will be able to download payload.

Continued on next page

KN52281,10044BE -19-02NOV12-5/12

LVAL11822—UN—02NOV10

NOTE: The search results page will show the customer's name, address, phone number and provide a link to the other equipment the customer owns. All the controllers available for the serial number entered will be displayed and the controllers that have new software payloads available will be checked for the user to download. The new software payload files will also be highlighted and marked "New". The user can check all or only the software payload files that are applicable to the operation being performed to download the files to the computer to update the controllers.

The installed version to be downloaded will be displayed to show the user the difference in the software versions. The installed version is the version loaded to the controller from the factory or the updated version from the return files sent from Service ADVISOR™ when the controller is updated with other software payload files. The file size will be displayed to show the user how large the software payload file is to download.

At the bottom of the serial number search results page all the related PIPs, if any, associated to the serial number entered will appear. The PIP name, number, type, and status will be visible with links to PIP details, field instructions and the PIP equipment list.

Software may be downloaded onto a computer that is not running Service ADVISOR™. It would then have to be transferred to a computer running Service ADVISOR™.

16. Choose the controller(s) that need software updated (H).



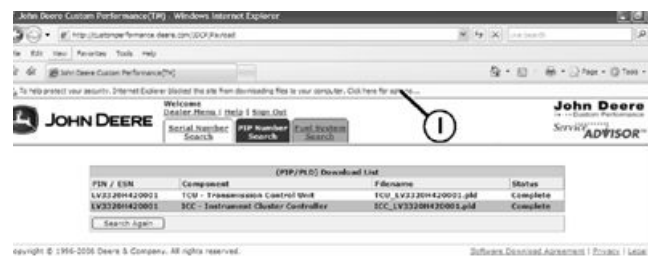
H—Controller Unit

KN52281,10044BE -19-02NOV12-6/12

17. A security warning (I) may appear that prevents download. Click on this warning and allow download.

NOTE: The software remains available for 45 days from the date of downloading. After 45 days, the software must be downloaded again.

18. Click "OK" once the payload(s) (PLD file extension) have been downloaded successfully.



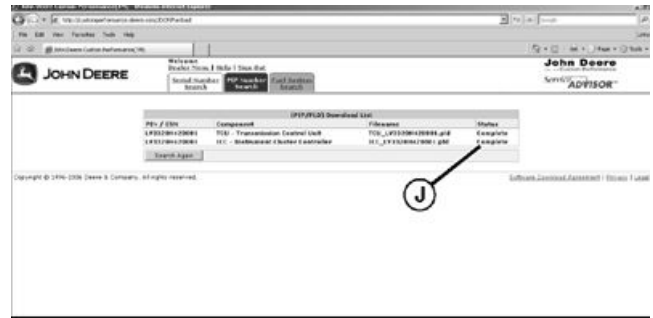
I— Security Warning

Continued on next page

KN52281,10044BE -19-02NOV12-7/12

19. Click “Sign Out” (J).
20. Click the “Close Window” button.
21. If another window appears to close the browser, click “Yes”.
22. Turn the key switch to the ON position.

J—Sign Out



LVAL11825—UN—02NOV10

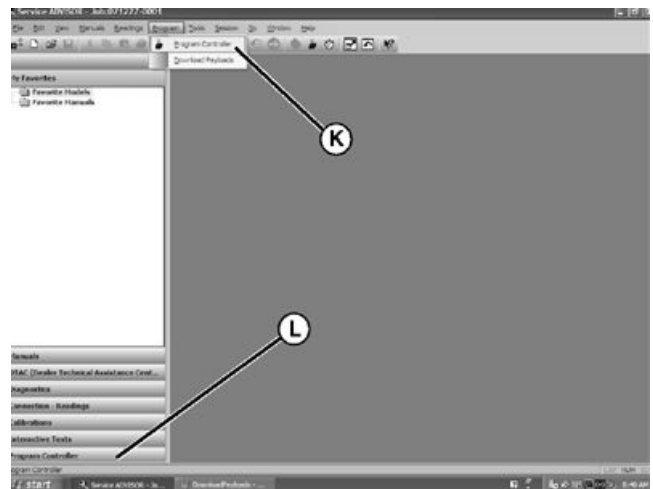
KN52281,10044BE -19-02NOV12-8/12

NOTE: On some machines when reprogramming specific control units, it is possible that controller address values may be deleted. Make a note of these values before doing the reprogramming. (See Configure The Display in Section 40, Group 45.)

23. Click on the “Program” drop down menu and choose the “Program Controller” option (K) or the “Program Controller sidebar menu option (L). A loading payload information screen will appear.

K—Program Controller

L—Program Controller Sidebar Menu Option



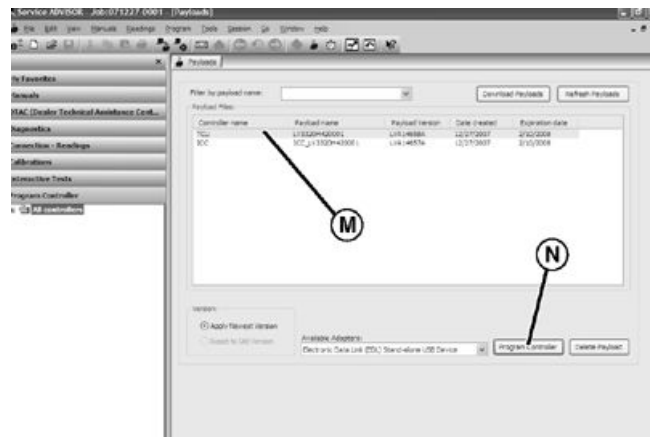
LVAL11826—UN—02NOV10

KN52281,10044BE -19-02NOV12-9/12

24. Click on the payload file (M) that was downloaded for this machine.

M—Payload File

N—Program Controller



LVAL11827—UN—02NOV10

Continued on next page

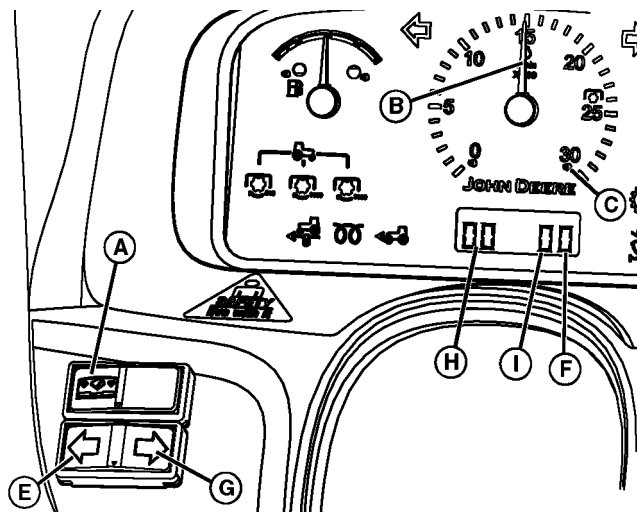
KN52281,10044BE -19-02NOV12-10/12

25. If programming the TCU, go to step 26. If programming the ICC, enter the machine into the configuration mode as follows:

- Turn the key switch to the OFF position.
- Press and hold the display mode switch (A) while performing the next step.
- Turn the key switch to the ON position and release the display mode switch before the engine speed gauge needle (B) hits the right peg (C).
- The display should read “00 00” (H, I, and F).

26. Click “Program Controller” (N).

A—Display Mode Switch
B—Engine Speed Gauge Needle
C—Right Peg
E—Arrow
F—0
G—Arrow
H—00
I—0



LVAL11828—UN—02NOV10

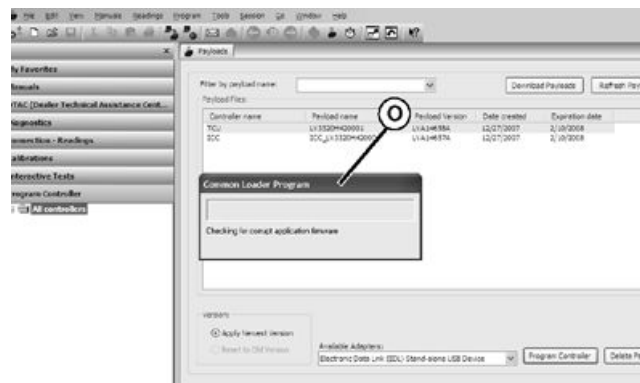
KN52281,10044BE -19-02NOV12-11/12

27. The “Common Loader Program” or “Engine Control Unit Loader Program” box will appear (O). This box will briefly display a series of processing activities.

28. Click “OK” once the “Payload Processor” box showing “Programming Successfully Completed” appears.

NOTE: If Payload Processor error message appears, programming was not successful and needs to be run again.

29. If programming was unsuccessful, unplug the PDM (Parallel Data Module or the EDL (Electronic Data Link) and plug it back in, then cycle the key switch OFF for five seconds and then turn the key switch to the ON position again (if programming ICC, repeat step 25). Retry programming.



O—Common Loader Program
or Engine Control Unit
Loader Program Box

LVAL11829—UN—02NOV10

KN52281,10044BE -19-02NOV12-12/12

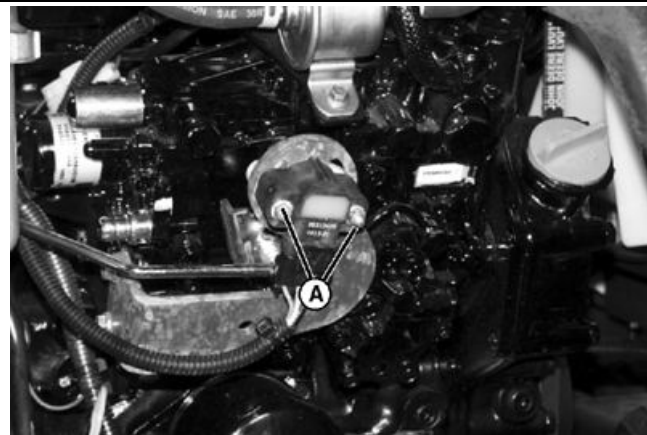
Throttle Position Sensor Removal and Installation

Removal:

1. Open hood and lock with prop rod.

IMPORTANT: Avoid Damage! Always disconnect the negative cable from the battery before working on any electrical components.

2. Remove the negative cable from the battery.
3. Remove the connector to the throttle sensor.
4. Remove the two nuts (A) securing the sensor to the mounting plate and throttle adaptor shaft and remove the sensor from the shaft.



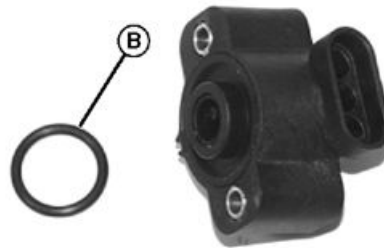
A—Nuts (2 used)

KN52281,10044BF -19-02NOV12-1/7

LVAL11830 —UN—02NOV10

5. Remove and inspect the O-ring (B) for damage.

B—O-Ring



KN52281,10044BF -19-02NOV12-2/7

LVAL11831 —UN—02NOV10

6. Remove the two cap screws (C) securing the throttle position sensor mounting bracket to the engine.

C—Cap Screws (2 used)



Continued on next page

KN52281,10044BF -19-02NOV12-3/7

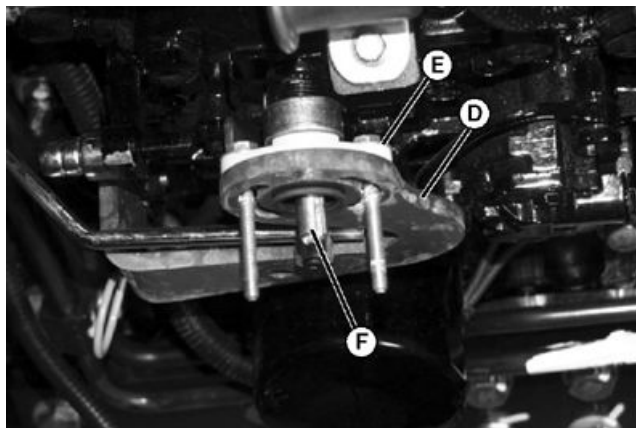
LVAL11832 —UN—02NOV10

- Remove bracket (D), sensor back plate (E) and throttle adaptor shaft (F).

D—Bracket

E—Sensor Back Plate

F—Adaptor

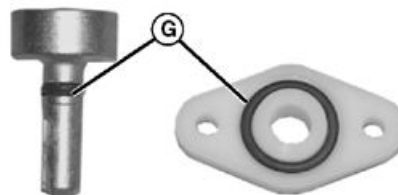


LVAL11833 —UN—02NOV10

KN52281,10044BF -19-02NOV12-4/7

- Inspect O-rings (G) on throttle adaptor shaft and sensor back plate for damage.

G—O-Ring (2 used)



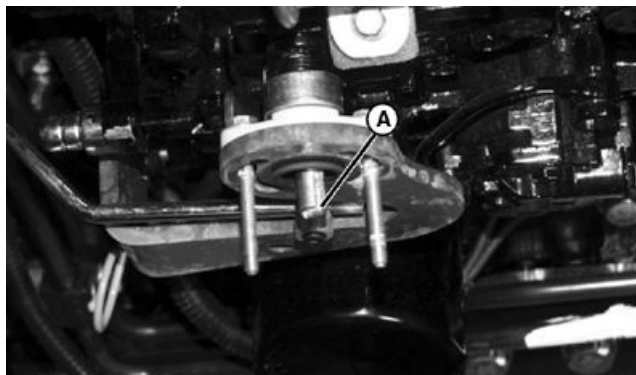
LVAL11834 —UN—02NOV10

KN52281,10044BF -19-02NOV12-5/7

Installation:

- Check the low idle setting, and adjust if needed. See Engine Section.
- Place the throttle lever in the low idle position.
- Install throttle adaptor shaft to the throttle nut with the key way (A) pointing towards the top of the machine and as vertical as possible. Ensuring that O-rings are in place, install the sensor back plate and bracket. Secure bracket with two cap screws.

A—Key Way



LVAL11835 —UN—02NOV10

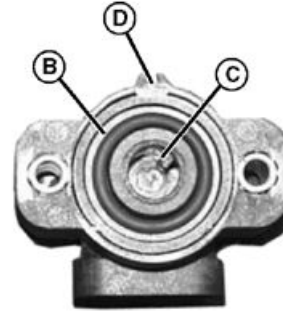
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KN52281,10044BF -19-02NOV12-6/7

4. Ensure that O-ring (B) is in place on throttle position sensor.
5. Align the sensor internal key (C) with the key way on the throttle adaptor and slide the sensor onto the throttle adaptor shaft. Slide the sensor back plate screws into the holes in the sensor body.
6. Rotate the sensor counterclockwise until the notch (D) is pointing towards the top of the machine and is as vertical as possible.
7. Install and tighten the sensor nuts until the sensor is snug, but can still be rotated by hand.
8. Adjust the throttle sensor to specification. (See eHydro™/Auto HST—Throttle Position Sensor Test and Adjustment in Section 40, Group 50.)
9. Hold the sensor in position and tighten the nuts to specification.
10. Install the throttle sensor connector.
11. Connect the negative battery cable.
12. Close and latch the hood.

Throttle Sensor—Specification

Input—Voltage..... 5.0 ± 0.2 volts
 Slow Idle Position
 Signal—Voltage..... 0.6—1.2 volts



B—O-Ring
 C—Internal Key

D—Notch

Fast Idle Position
 Signal—Voltage..... 2.0—3.7 volts
 greater than slow idle signal voltage

Sensor Lock
 Nut—Torque..... 5 N·m (44.25 lb-in.)

KN52281,10044BF -19-02NOV12-7/7

LVAL11836—UN—02NOV10

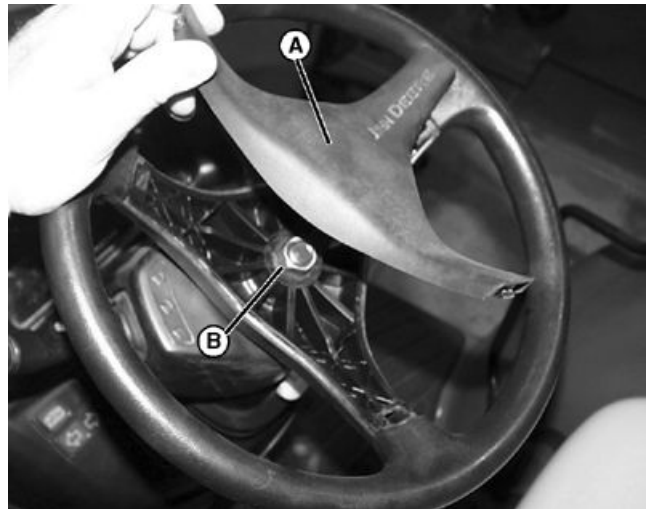
Auto HST Direction Switch Replacement

Removal:

1. Park machine safely and disconnect negative battery cable.
2. Remove steering wheel cover (A), nut (B), and steering wheel.

A—Cover

B—Nut



Continued on next page

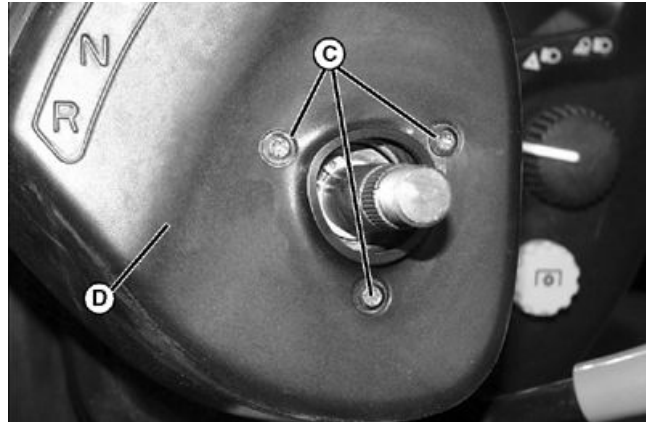
KN52281,10044C0 -19-02NOV12-1/5

LVAL11837—UN—02NOV10

3. Remove three screws (C) and cover (D).

C—Screws (3 used)

D—Cover

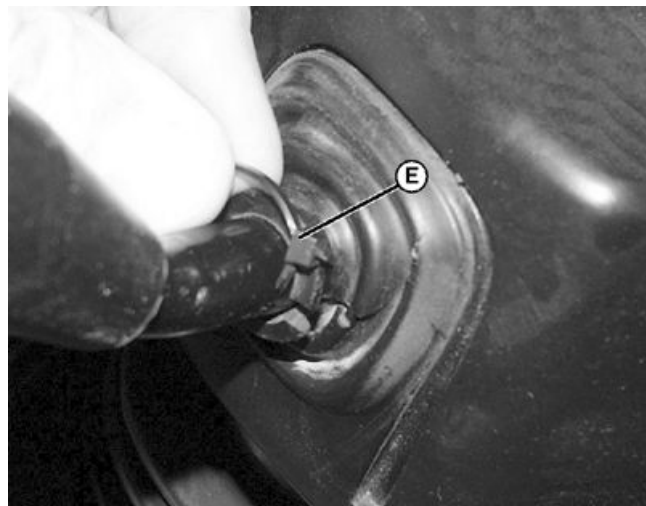


LVAL 11838 —UN—02NOV10

KN52281,10044C0 -19-02NOV12-2/5

4. Cut and remove plastic tie (E) from shifter boot.

E—Plastic Tie



LVAL 11839 —UN—02NOV10

KN52281,10044C0 -19-02NOV12-3/5

5. Pull rubber boot out of dash panel, and then up over switch and steering shaft.



LVAL 11840 —UN—02NOV10

Continued on next page

KN52281,10044C0 -19-02NOV12-4/5

6. Disconnect plug (F). Remove screws and nuts (G) and remove switch.

Installation:

- Install switch in the reverse order of removal.
- Tighten steering wheel to specification.

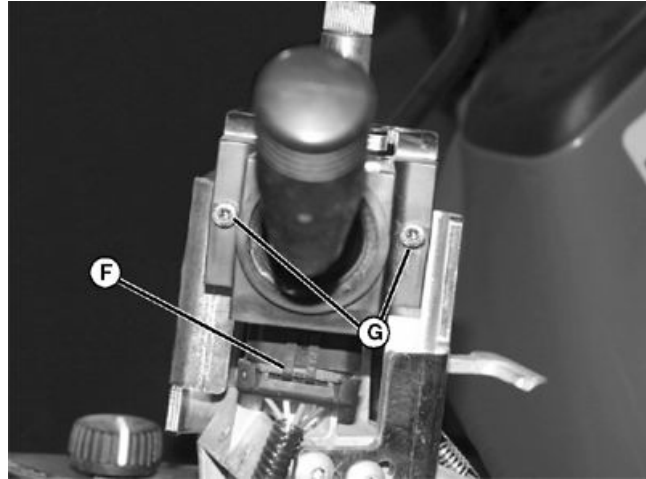
Specification

Steering Wheel

Nut—Torque..... 39—49 N·m (29—36 lb-ft)

F—Plug

G—Screw and nut (2 ea. used)



LVAL11841—UN—02NOV10

KN52281,10044C0 -19-02NOV12-5/5

Electronic Drive Controller Removal and Installation

Removal:

1. Open hood and lock with prop rod.

IMPORTANT: Avoid Damage! Always disconnect the negative cable from the battery before working on any electrical components.

2. Remove the negative cable from the battery.
3. Remove fuse panel cover.
4. Remove connector screw and connector from drive controller.

5. Remove two screws securing drive controller to chassis and remove drive controller.

Installation:

Installation is the reverse of removal. Tighten cap screws to specification.

Specification

Mounting Cap

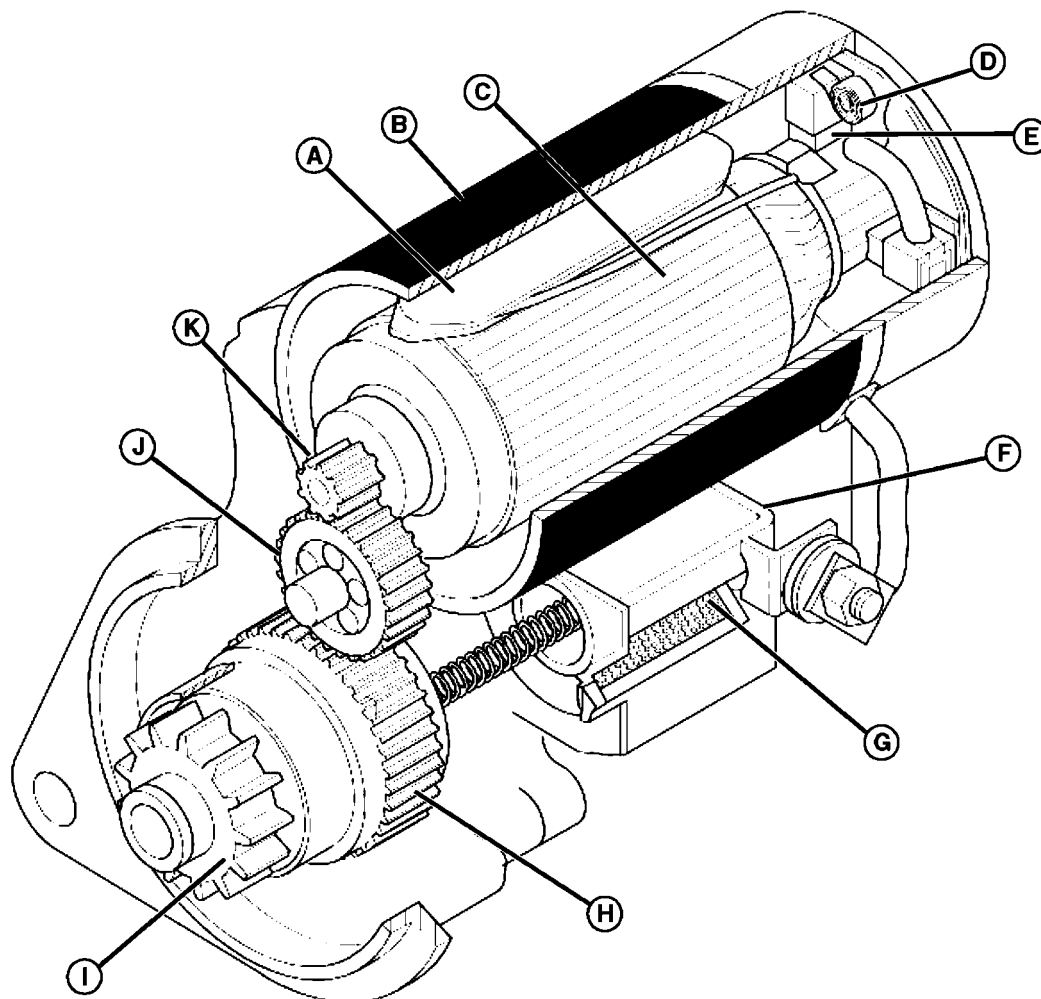
Screw—Torque..... 7.5 N·m (66.3 lb-in.)

Connector Cap

Screw—Torque..... 2.0 N·m (17.7 lb-in.)

KN52281,10044C1 -19-02NOV12-1/1

Starting Motor Disassembly and Assembly



A—Motor
B—Field Coil
C—Armature
D—Brush Spring

E—Brush
F—Plunger
G—Solenoid
H—Overrunning Clutch

I—Pinion
J—Idler Gear
K—Drive Gear

KN52281,10044C2 -19-02NOV12-1/7

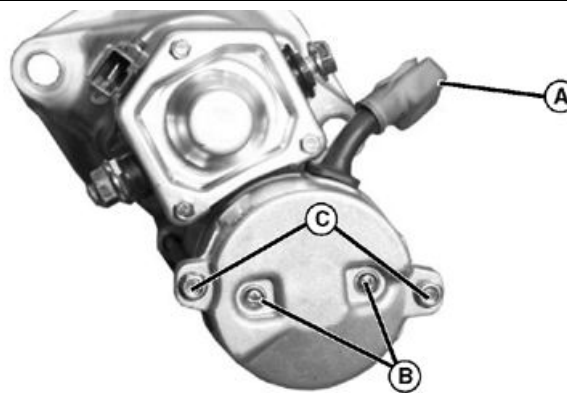
LVAL11842—UN—02NOV10

Disassembly:

1. Disconnect the field lead (A).
2. Remove the cover screws (B).
3. Remove the cap screws (C) that secure the motor to the clutch housing.

A—Field Lead
B—Screw (2 used)

C—Cap Screw (2 used)



Continued on next page

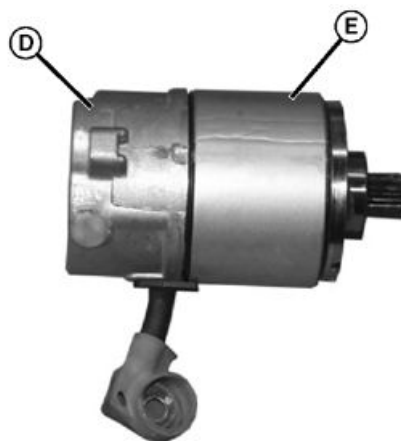
KN52281,10044C2 -19-02NOV12-2/7

LVAL11843—UN—02NOV10

4. Separate the cover (D) from the motor (E).

D—Cover

E—Motor



LVAL11844 —UN—02NOV10

KN52281,10044C2 -19-02NOV12-3/7

5. Remove motor (E), armature (F), and brush holder (G) as a unit from the clutch housing.

E—Motor

G—Brush Holder

F—Armature



LVAL11845 —UN—02NOV10

KN52281,10044C2 -19-02NOV12-4/7

NOTE: Brushes are not serviceable separately. If the brushes require replacement, the entire brush holder, with brushes attached, must be replaced.

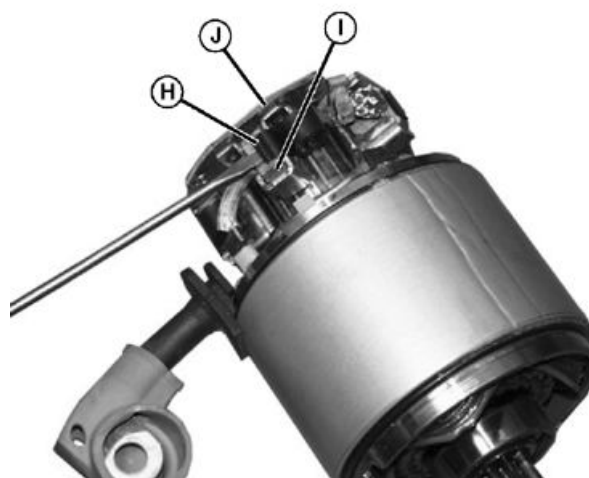
6. Pry the brush springs (H) away and pull the negative brushes (I) up enough to allow the springs to hold the brushes in place.

7. Remove the brush holder (J).

H—Brush Springs

J—Brush Holder

I— Negative Brushes



LVAL11846 —UN—02NOV10

Continued on next page

KN52281,10044C2 -19-02NOV12-5/7

8. Remove the armature (F) from the field coil housing (K).
9. Inspect and test the brushes, holder, field coil and armature. (See Starting Motor Inspection/Test in Section 40, Group 60.)

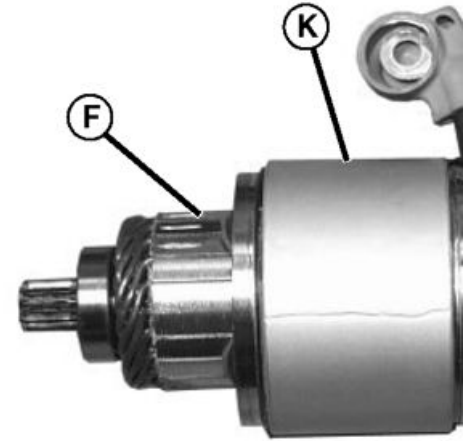
Assembly:

Assembly is done in the reverse order of disassembly.

NOTE: Apply multipurpose grease to bearing cup inside rear cover.

F—Armature

K—Field Coil Housing



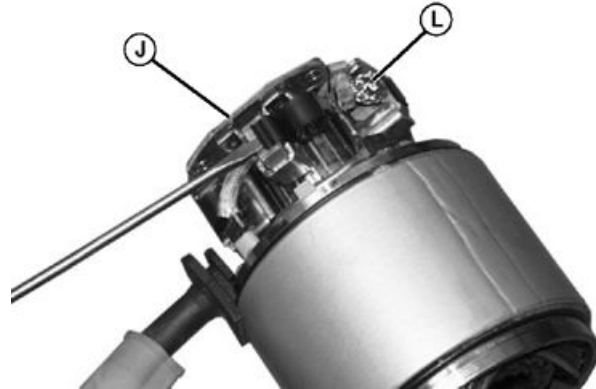
LVAL11847 —UN—02NOV10

KN52281,10044C2 -19-02NOV12-6/7

IMPORTANT: Avoid Damage! When installing the rear cover, be sure the field coil brush wires (L) do not touch the cover. Turn the brush holder (J) slightly to take up slack in the brush wires. Press the wires inward to clear the rear cover.

J—Brush Holder

L—Field Coil Brush Wires



LVAL11848 —UN—02NOV10

KN52281,10044C2 -19-02NOV12-7/7

Starting Motor Inspection/Test

1. Measure brush lengths (A) on field winding housing (F) and brush holder (D). Replace brush assemblies if length is below minimum.

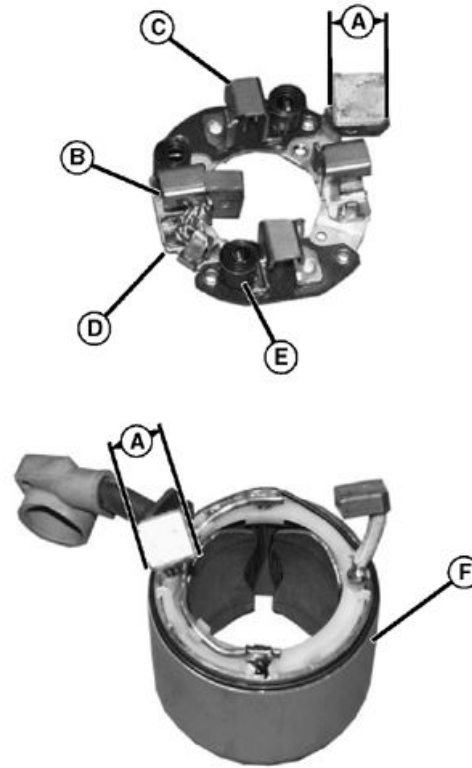
Specification

Brush—Length
(minimum)..... 8.5 mm (0.335 in.)

NOTE: Test brush holder using an ohmmeter or test light.

2. Test brush holder assembly (K):
 - Touch one probe of tester to negative brush holder (B) and other probe to field brush holder (C).
 - If there is continuity, replace the brush holder.
3. Inspect springs (E) for wear or damage. Replace if necessary.

A—Brush Lengths	D—Brush Holder
B—Negative Brush Holder	E—Springs
C—Field Brush Holder	F—Field Winding Housing



LVAL11849 —UN—02NOV10

LVAL11850 —UN—02NOV10

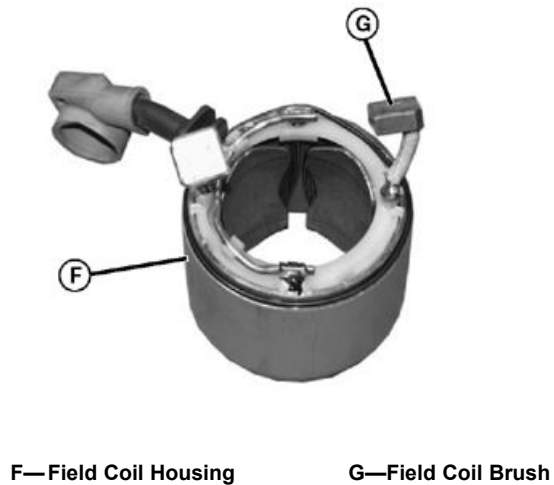
KN52281,10044C3 -19-16JAN13-1/5

NOTE: Test field coil using an ohmmeter or test light.

4. Test for grounded field winding:
 - a. Touch one probe of tester to field coil brush (G) and other probe to field coil housing (F).
 - b. Be sure the brush lead is not touching the frame. If there is continuity, the coil is grounded and the field coil housing assembly must be replaced.

IMPORTANT: Avoid Damage! Do not clean armature with solvent. Solvent can damage insulation on windings. Use only mineral spirits and a soft bristle brush.

5. Test for open field coil:
 - Touch one probe of tester to each field coil brush.
 - If there is no continuity, the field coil is open and the field coil housing assembly must be replaced.
6. Inspect armature. Look for signs of dragging against pole shoes.
7. Inspect commutator. Look for roughness, burned bars, or any material which might cause short circuits



F—Field Coil Housing

G—Field Coil Brush

between bars. If necessary, clean and touch up with 400 sandpaper. NEVER use emery cloth. Clean all dust from armature when finished.

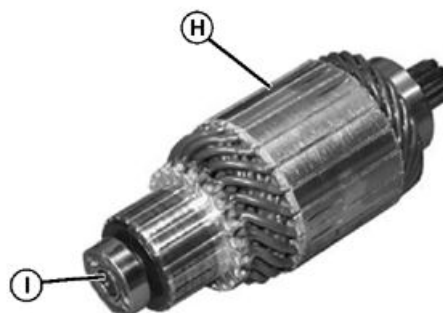
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KN52281,10044C3 -19-16JAN13-2/5

LVAL11851 —UN—02NOV10

NOTE: Test armature windings using an ohmmeter or test light.

8. Test for grounded windings:
 - a. Touch probes on one commutator bar (H) and armature shaft (I). Armature windings are connected in series, so only one commutator bar needs to be checked.
 - b. If test shows continuity, a winding is grounded and the armature must be replaced.
9. Test for open circuit windings:
 - Touch probes on two different commutator bars.
 - If test shows no continuity, there is an open circuit and the armature must be replaced.



H—Commutator Bar

I—Armature Shaft

KN52281,10044C3 -19-16JAN13-3/5

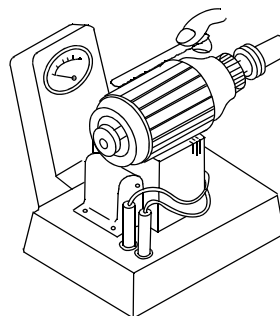
LVAL11852 —UN—02NOV10

10. Test for short circuit windings using a growler.

- Put armature in a growler and hold a hacksaw blade above each slot while slowly rotating armature.
- If coil is shorted, the blade will vibrate on the slot.

NOTE: A short circuit most often occurs because of copper dust or filings between two commutator segments.

11. If test indicates short circuit windings, clean the commutator of dust and filings. Check the armature again. If the test still indicates a short circuit, replace the armature.
12. Inspect armature cover and housing bearings for wear or damage. Replace if necessary.



KN52281,10044C3 -19-16JAN13-4/5

LVAL11853 —UN—02NOV10

To Replace Bearings:

NOTE: The bearings are press fit.

1. Remove the bearings using a knife-edge puller set.

IMPORTANT: Avoid Damage! Install both bearings with the sealed side toward armature.

2. Install a new housing bearing (J) tight against the shoulder of the shaft using an appropriate size socket that only presses on the inner race of the bearing.
3. Install a new cover bearing (K) tight against the shoulder of the shaft using a driver set.



J—Housing Bearing

K—Cover Bearing

KN52281,10044C3 -19-16JAN13-5/5

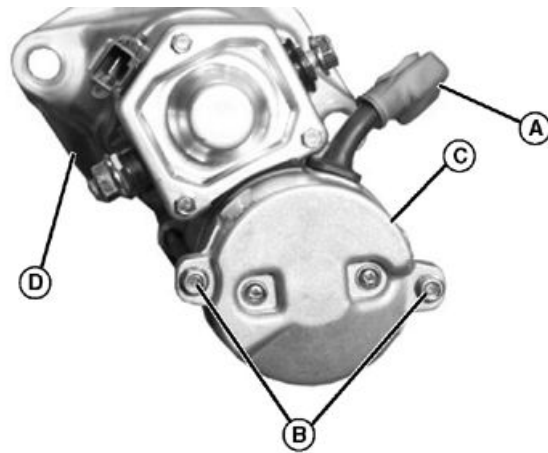
LVAL11854 —UN—02NOV10

Starting Motor Gear Train

Disassembly/Inspection:

1. Remove the field wire (A) and two motor-to-clutch housing cap screws (B).
2. Remove the motor (C) from the clutch housing (D).

A—Field Wire
B—Cap Screws (2 used)
C—Motor
D—Clutch Housing



LVAL11855—UN—02NOV10

KN52281,10044C4 -19-02NOV12-1/9

3. Remove two clutch housing-to-solenoid housing screws (E) to separate the clutch housing from the solenoid/motor assembly.

E—Screw (2 used)

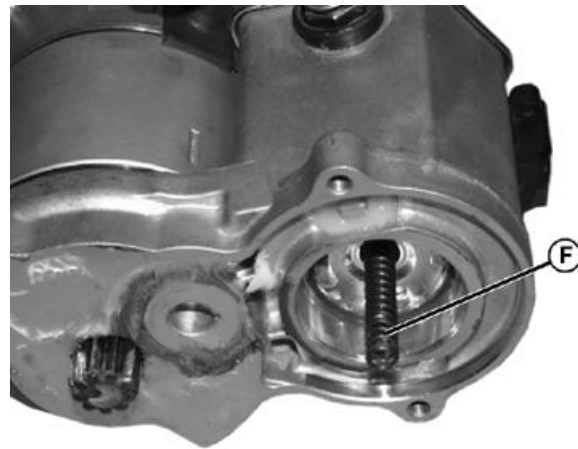


LVAL11856—UN—02NOV10

KN52281,10044C4 -19-02NOV12-2/9

4. Remove the plunger spring (F).

F—Plunger Spring



LVAL11857—UN—02NOV10

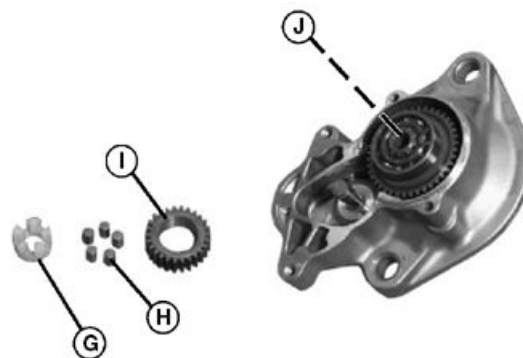
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KN52281,10044C4 -19-02NOV12-3/9

5. Remove the retainer (G), five rollers (H), and pinion gear (I).
6. Remove the steel ball (J).

G—Retainer
H—Roller (5 used)

I—Pinion Gear
J—Steel Ball

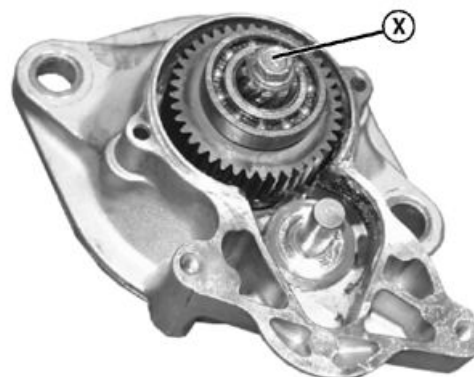


LVAL11858 —UN—02NOV10

KN52281,10044C4 -19-02NOV12-4/9

7. Place a short capscrew (X) in clutch shaft bore to allow maximum drive gear spring compression.

X—Cap Screw



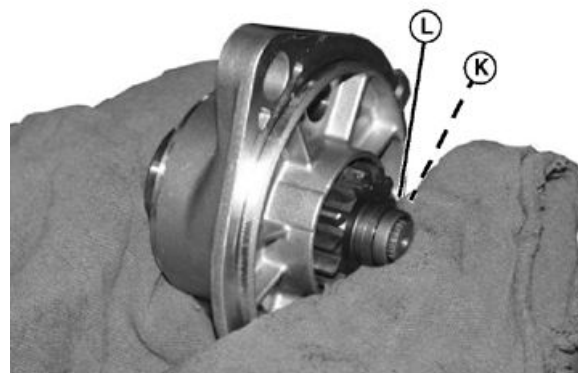
LVAL11859 —UN—02NOV10

KN52281,10044C4 -19-02NOV12-5/9

8. Put the clutch housing assembly into a soft-jawed vise, as shown.
9. Tighten the vise slowly, until the drive gear spring compresses.

⚠ CAUTION: Avoid Injury! The shaft could be propelled from the clutch unit with considerable force if the spring is not allowed to extend fully while in the vise!

10. Remove the circlip (K) and retainer (L).
11. While holding the clutch assembly, slowly open the vise until all spring compression is relieved.



K—Circlip

L—Retainer

LVAL11860 —UN—02NOV10

Continued on next page

KN52281,10044C4 -19-02NOV12-6/9

12. Remove the drive gear (A), and clutch assembly (C) from the housing (D).

A—Drive Gear
B—Retainer

C—Clutch Assembly
D—Housing



LVAL11862—UN—02NOV10

KN52281,10044C4 -19-02NOV12-7/9

13. Remove spring from drive gear (X).

X—Drive Gear



LVAL11863—UN—02NOV10

KN52281,10044C4 -19-02NOV12-8/9

14. Remove the toothed washer (E), spring (F), and clutch shaft (G).

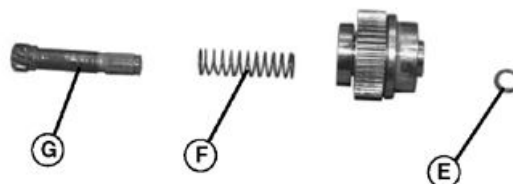
15. Inspect all parts for wear or damage.

Assembly:

Assembly is done in the reverse order of disassembly.

- Apply multipurpose grease to bearings, clutch shaft, springs, pinion gears, retainer, rollers and steel ball.
- Install the large washer with the flat side toward the clutch assembly.
- Install the roller retainer (X) with the cupped side away from the clutch assembly.

X—Roller Retainer



E—Toothed Washer
F—Spring

G—Shaft



LVAL11864—UN—02NOV10

LVAL11865—UN—02NOV10

KN52281,10044C4 -19-02NOV12-9/9

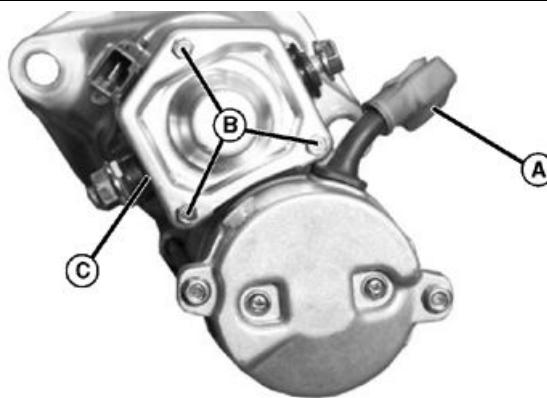
Starting Motor Solenoid

Disassembly/Inspection:

1. Disconnect the field lead (A).
2. Remove three screws (B), the cover and gasket (C).

A—Field Lead
B—Screw (3 used)

C—Gasket



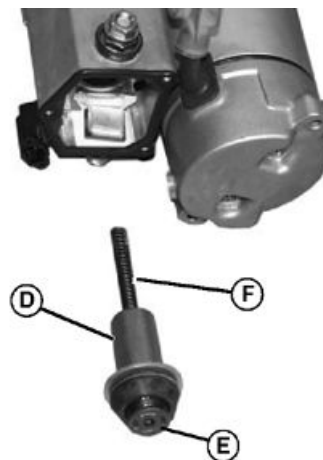
LVAL11866 —UN—02NOV10

KN52281,10044C5 -19-02NOV12-1/4

3. Remove the plunger (D).
4. Inspect the copper washer (E) and spring (F).

D—Plunger
E—Copper Washer

F—Spring

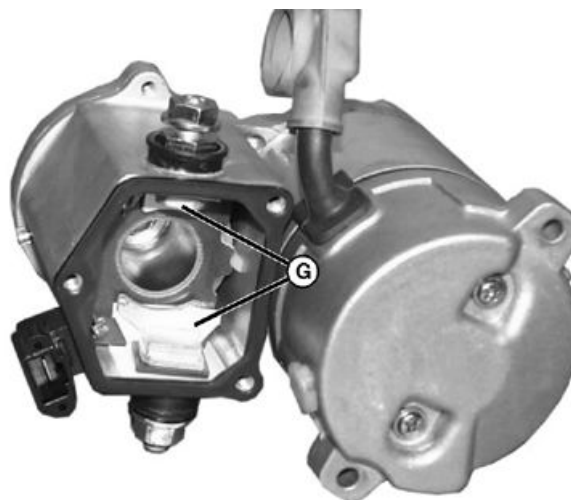


LVAL11867 —UN—02NOV10

KN52281,10044C5 -19-02NOV12-2/4

5. Inspect the contact plates (G) for excessive burning or pitting. Contacts and plunger come as a kit. If contacts or plunger are defective, replace all the parts with the kit.

G—Contact Plates



LVAL11868 —UN—02NOV10

Continued on next page

KN52281,10044C5 -19-02NOV12-3/4

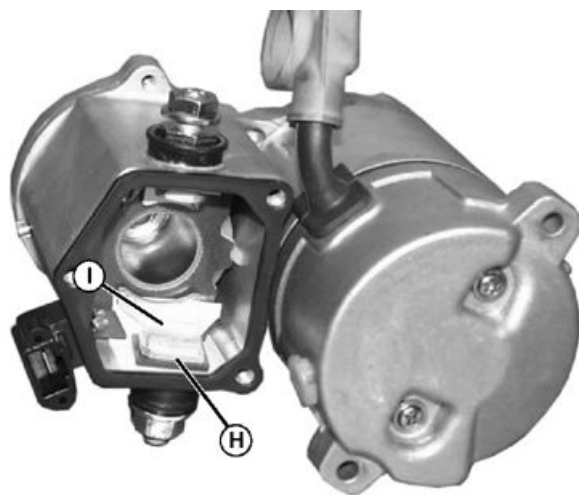
Assembly:

Assembly is done in the reverse order of disassembly.

NOTE: The assembly sequence of the left and right terminals is similar. Be sure solenoid terminal lead (H) is installed between terminal bolt and contact plate. Also, be sure smaller contact plate (I) is on the left side.

H—Solenoid Terminal Lead

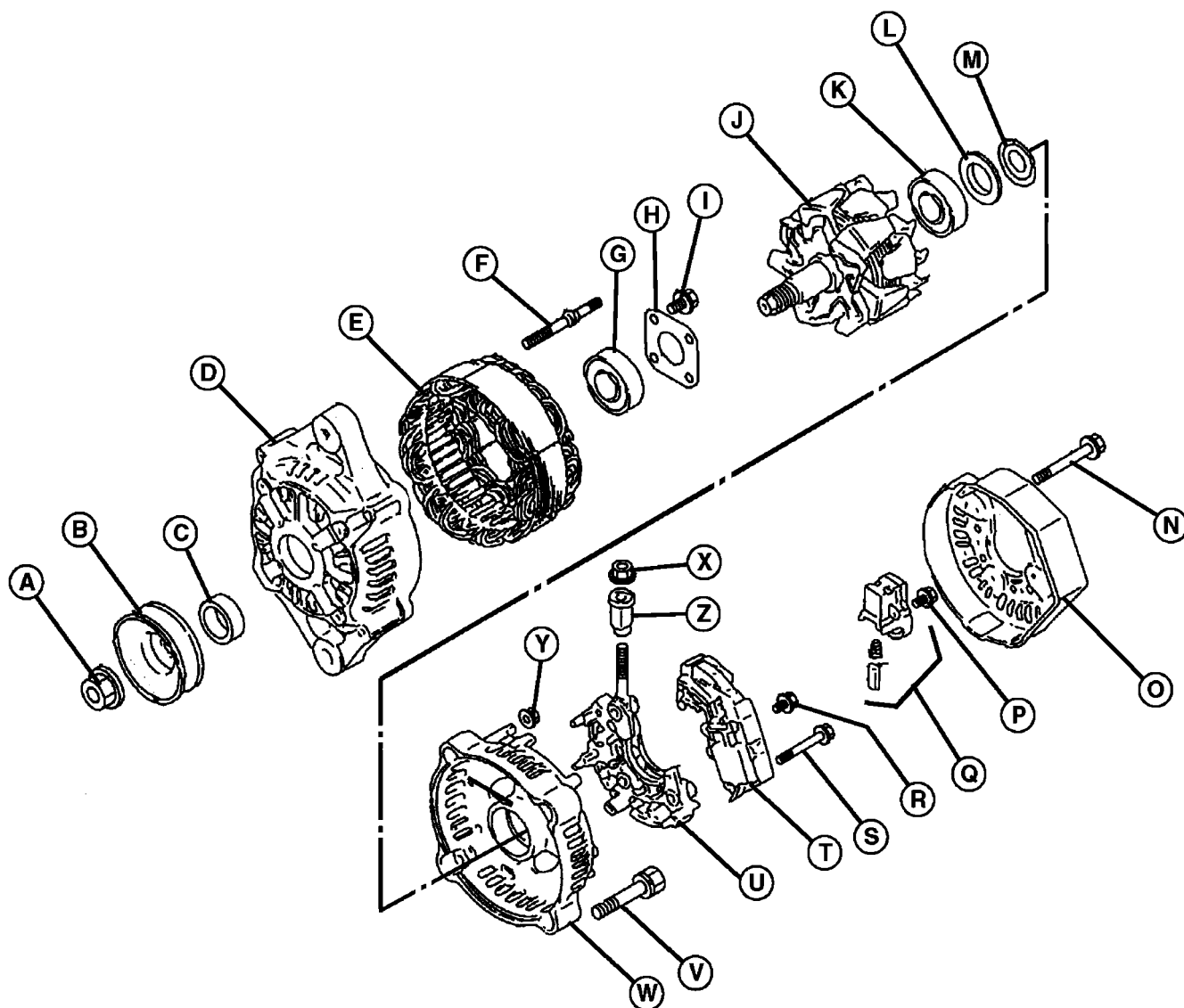
I— Contact Plate



LVAL11869 —UN—02NOV10

KN52281,10044C5 -19-02NOV12-4/4

Alternator Components



A—Nut
B—Pulley
C—Spacer (40 amp only)
D—Front Frame
E—Stator
F—Stud (2)
G—Bearing

H—Cover
I—Screw (4)
J—Rotor
K—Bearing
L—Cover
M—Thrust Washer (40 amp)
N—Cap Screw (3)

O—Cover
P—Screw
Q—Brush Assembly
R—Screw (2 Gold, 1 Black)
S—Screw (2)
T—Regulator
U—Diode Assembly

V—Cap Screw
W—Rear Frame
X—Nut
Y—Nut (2)
Z—Insulator Bushing

LVAL 11870 —UN—02NOV10

KN52281,10044C6 -19-02NOV12-1/1

Alternator Removal and Installation

Removal:

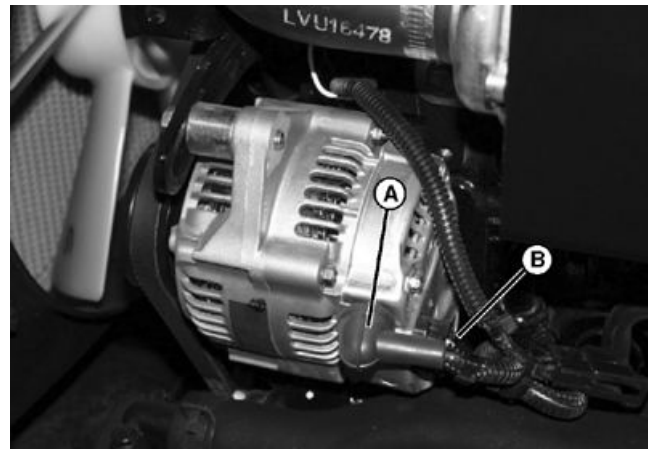
1. Open hood and lock with prop rod.

IMPORTANT: Avoid Damage! Always disconnect the negative cable from the battery before working on any electrical components.

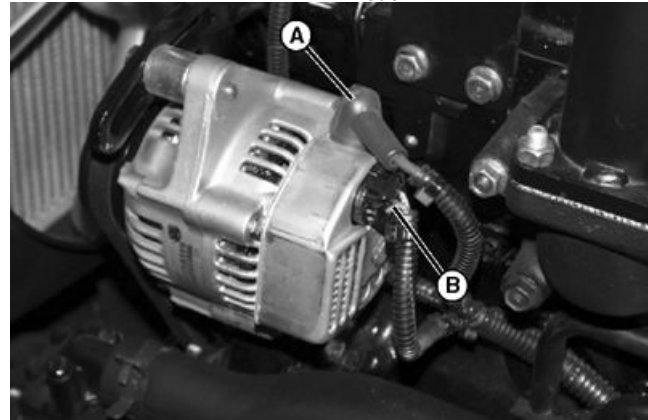
2. Remove the negative cable from the battery.
3. Remove the protective cover from the alternator battery terminal and remove the battery lead (A).
4. Remove the tachometer, discharge, and voltage sensing leads connector (B) from the alternator and move wiring harness to the side.

A—Battery Lead

B—Connector



PRT Model



eHydro™ Model

LVAL11871—UN—02NOV10

LVAL11872—UN—02NOV10

KN52281,10044C7 -19-02NOV12-1/2

5. Remove lower alternator nut (C), upper cap screw (D), and spacer (E). Remove alternator from machine.

Installation:

Installation is done in the reverse order of removal. Tighten cap screws to specification.

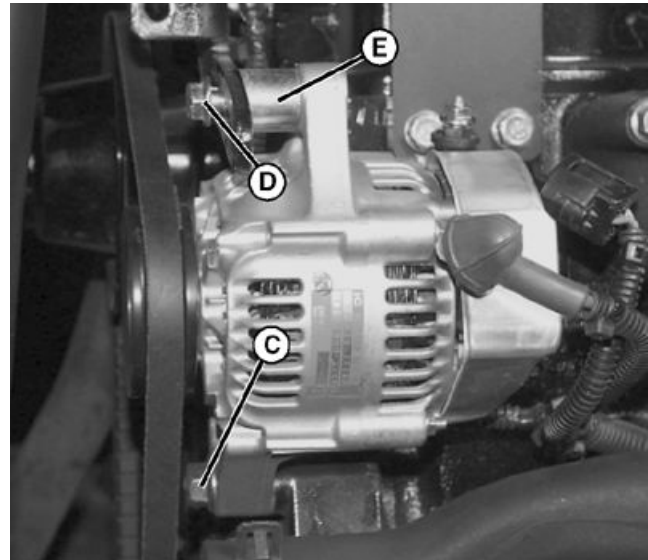
Specification

Alternator Cap
Screw—Torque..... 40 N·m (30 lb.-ft.)

C—Nut

D—Cap Screw

E—Spacer



LVAL11873—UN—02NOV10

KN52281,10044C7 -19-02NOV12-2/2

Alternator Disassembly and Assembly

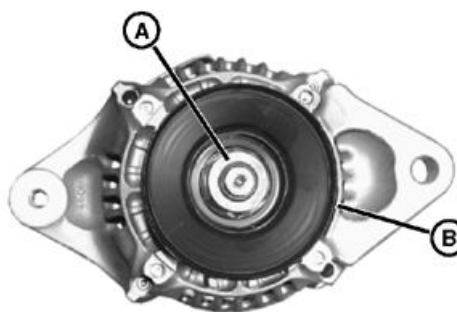
Disassembly:

NOTE: Clamp pulley in soft jaw vise and use an impact wrench to remove pulley nut.

1. Remove pulley nut (A).
2. Use a puller to remove pulley (B).

A—Nut

B—Pulley

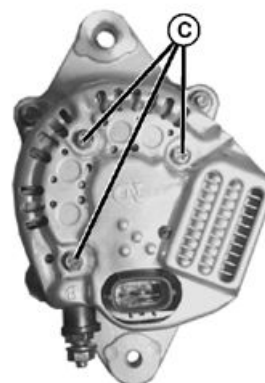


LVAL11874—UN—02NOV10

KN52281,10044C8 -19-16JAN13-1/20

3. Remove three cap screws (C) securing alternator rear cover to alternator.

C—Cap Screw (3 used)



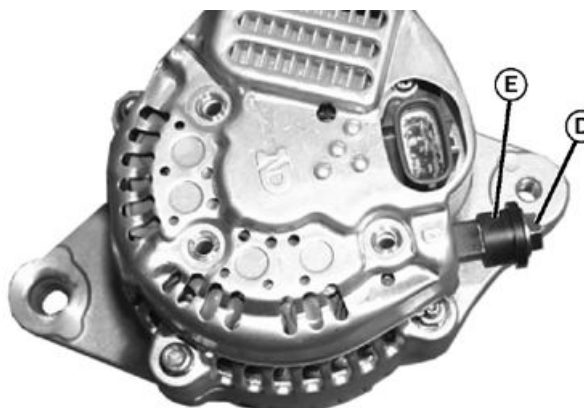
LVAL11875—UN—02NOV10

KN52281,10044C8 -19-16JAN13-2/20

4. Loosen positive post retaining nut (D) enough to pull insulator (E) clear of rear cover. Remove rear cover.

D—Positive Post Retaining Nut

E—Insulator



LVAL11876—UN—02NOV10

Continued on next page

KN52281,10044C8 -19-16JAN13-3/20

5. Remove four voltage regulator screws (F) and black brush screw (G).
6. Remove regulator and brush assemblies.

F—Screw (4 used)

G—Brush Screw

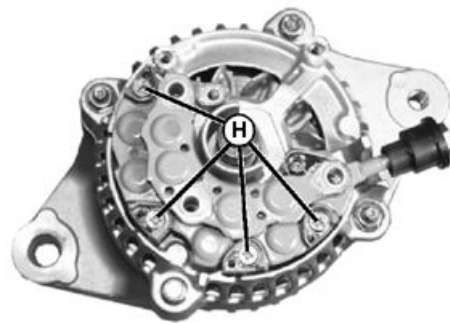


LVAL11877 —UN—02NOV10

KN52281,10044C8 -19-16JAN13-4/20

7. Remove four screws (H) retaining rectifier to alternator body.

H—Screw (4 used)



LVAL11878 —UN—02NOV10

KN52281,10044C8 -19-16JAN13-5/20

8. Straighten the four wire leads (I) to allow removal of the rear half of alternator case.
9. Separate the two alternator case halves.

I—Wire Lead (4 used)



LVAL11879 —UN—02NOV10

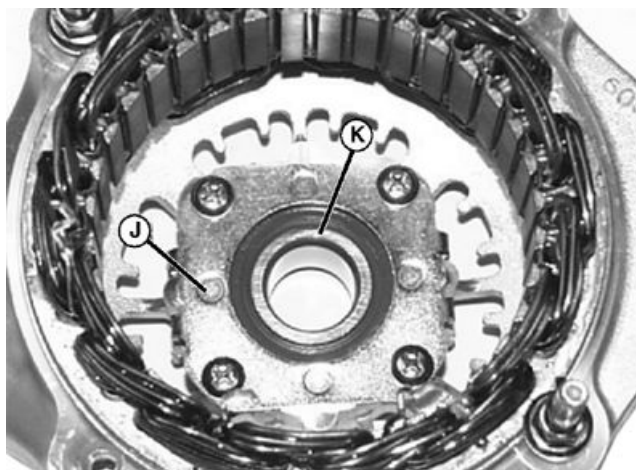
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KN52281,10044C8 -19-16JAN13-6/20

10. Remove retainer plate (J).
11. Press bearing (K) from case.

J— Retainer Plate

K—Bearing



LVAL11880 —UN—02NOV10

KN52281,10044C8 -19-16JAN13-7/20

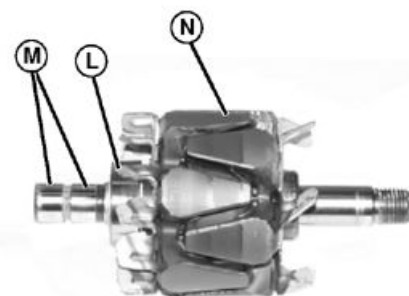
Inspection:

1. Inspect bearing (L) for smooth rotation. Replace if necessary.
2. Inspect slip rings (M) for dirt or rough spots. If necessary, use No. 00 sandpaper or 400-grit silicon carbide paper to polish rings.
3. Measure outer diameter of slip rings (M). Replace rotor if less than specification (see Specification below).
4. Check continuity between slip rings (M) using ohmmeter or continuity tester. Replace rotor assembly if there is no continuity.

NOTE: Use an ohmmeter that is sensitive to 0—1 ohm.

5. Check continuity between slip rings and rotor core (N). Replace rotor assembly if there is continuity.
6. Inspect stator for defective insulation, discoloration, or burned odor.

NOTE: Set ohmmeter to the K Ohm range.



L— Bearing
M—Slip Rings

N—Rotor Core

7. Check for continuity between each stator lead and body. Replace stator if there is continuity.

LVAL11881 —UN—02NOV10

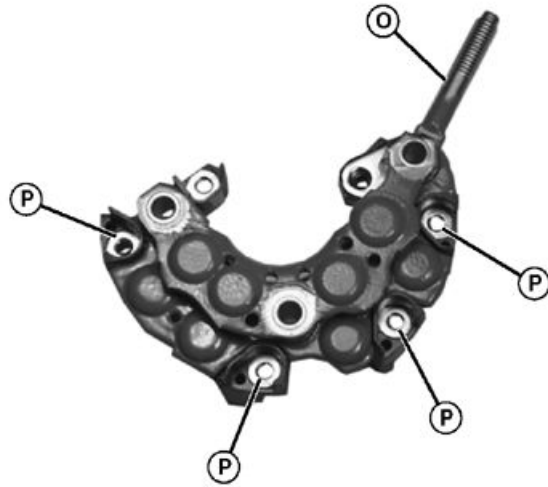
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KN52281,10044C8 -19-16JAN13-8/20

8. Check continuity between lead (O) and each diode lead (P). Reverse ohmmeter leads and recheck. There should be continuity in one direction, but not the other. Replace diodes or rectifier plate if bad.

O—Lead

P—Diode Lead



LVAL11882 —UN—02NOV10

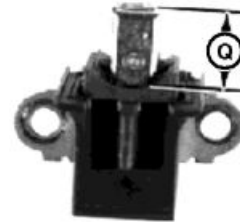
KN52281,10044C8 -19-16JAN13-9/20

9. Measure length of brush (Q) protruding from holder. Replace brushes if worn below minimum. Dimension should be within specification.

Specification

Slip Ring—Diameter
(minimum)..... 14.0 mm (0.55 in.)

Q—Brush Length



LVAL11883 —UN—02NOV10

KN52281,10044C8 -19-16JAN13-10/20

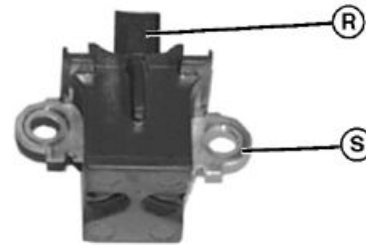
10. Check continuity between brush (R) and terminal (S). There should be continuity only at these points. Repeat procedure for other brush and terminal. There should be continuity only at these points.

Specification

Exposed
Brush—Length..... Minimum 4.5 mm (0.17 in.)
Exposed
Brush—Length..... Maximum 10.5 mm (0.41 in.)

R—Brush

S—Terminal



LVAL11884 —UN—02NOV10

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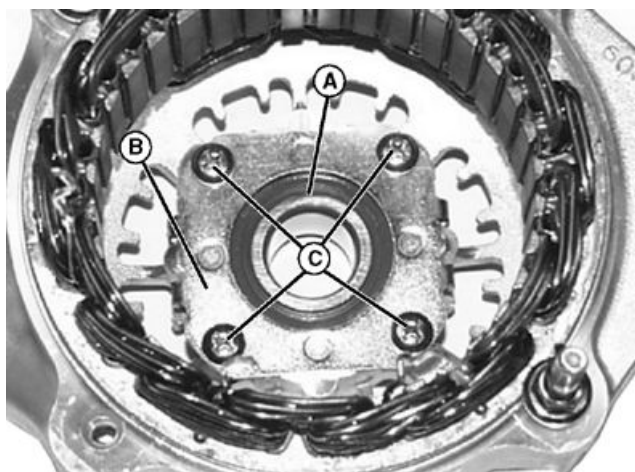
KN52281,10044C8 -19-16JAN13-11/20

Assembly:

1. Press new bearing (A) into case and install retainer plate (B).
2. Install four screws (C).

A—Bearing
B—Retainer Plate

C—Screw (4 used)



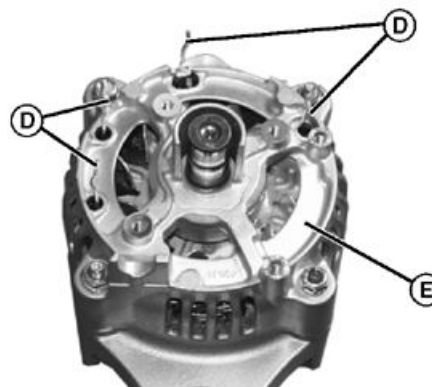
LVAL11885—UN—02NOV10

KN52281,10044C8 -19-16JAN13-12/20

3. Route stator leads (D) through holes in rear case (E).

D—Stator Lead (4 used)

E—Rear Case



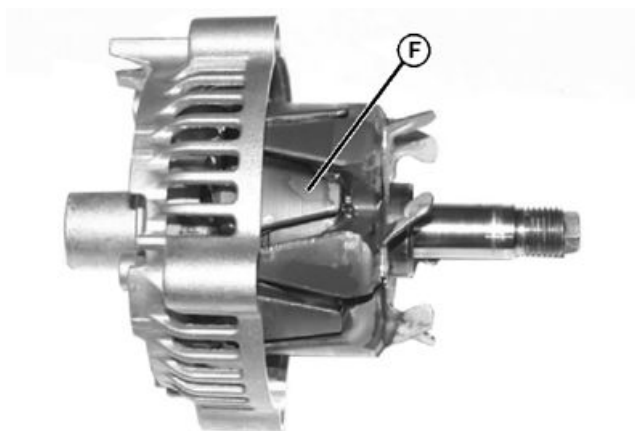
LVAL11886—UN—02NOV10

KN52281,10044C8 -19-16JAN13-13/20

NOTE: Check that rotor fan does not contact case and that rotor assembly turns smoothly in bearing.

4. Press rotor shaft (F) into rear case.

F—Rotor Shaft



LVAL11887—UN—02NOV10

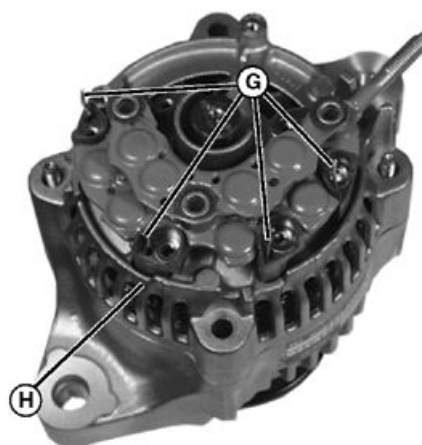
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KN52281,10044C8 -19-16JAN13-14/20

5. Route stator leads (G) through holes in rectifier (H) and install rectifier.

G—Stator Lead (4 used)

H—Rectifier

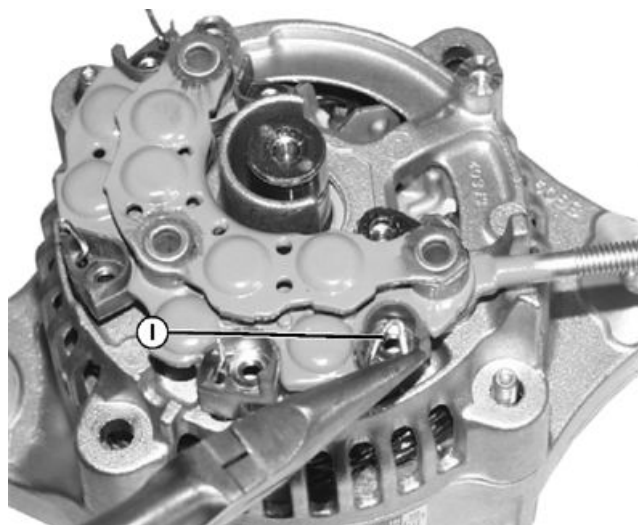


LVAL11888—UN—02NOV10

KN52281,10044C8 -19-16JAN13-15/20

6. Using needle nose pliers, form a loop (I) in each stator wire lead and install screws through the loops.

I— Loop



LVAL11889—UN—02NOV10

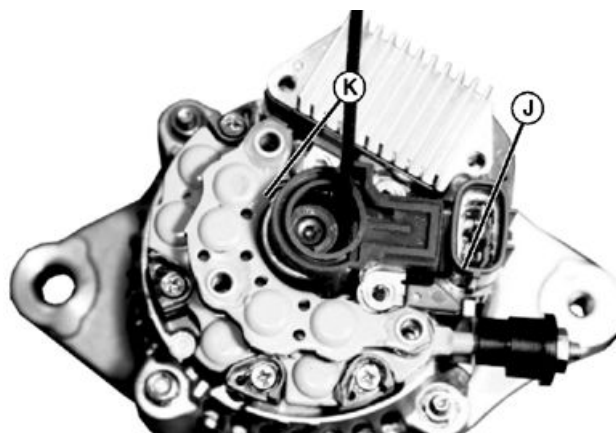
KN52281,10044C8 -19-16JAN13-16/20

IMPORTANT: Avoid Damage! Check that short, black, screw is installed in regulator tab. Longer screw contact frame and cause damage to the charging system.

7. Install regulator (J).
8. Using a small screwdriver to hold brushes, install brush holder (K).

J— Regulator

K—Brush Holder



LVAL11890—UN—02NOV10

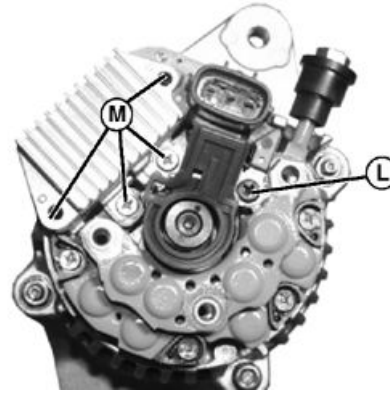
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KN52281,10044C8 -19-16JAN13-17/20

9. Install brush holder screws as shown; black screw (L) and light screws (M).

L—Black Screw

M—Light Screw (4 used)



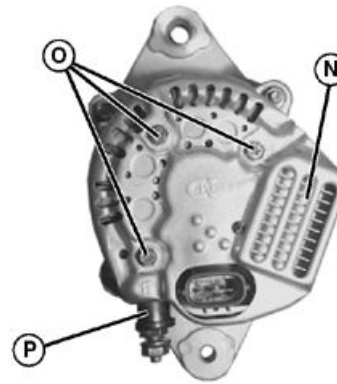
LVAL11891—UN—02NOV10

KN52281,10044C8 -19-16JAN13-18/20

10. Install regulator cover (N) and screws (O).
11. Install insulator (P) and nut.
12. Install sheave.

N—Regulator Cover
O—Screw (3 used)

P—Insulator



LVAL11892—UN—02NOV10

KN52281,10044C8 -19-16JAN13-19/20

13. Clamp sheave in soft jaw vise. Install sheave nut (Q) and tighten to specification.

Specification

Sheave Nut—Torque..... 69 N·m (51 lb.-ft.)
Pulley Nut—Torque..... 54 N·m (40 lb.-ft.)

Q—Sheave Nut



LVAL11893—UN—02NOV10

KN52281,10044C8 -19-16JAN13-20/20

Fuel Gauge Sensor Removal and Installation

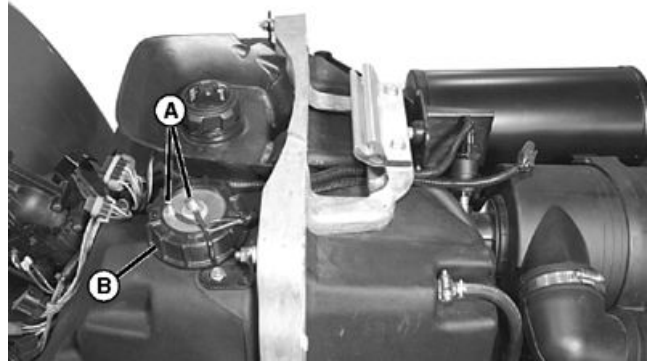
Removal:

CAUTION: Avoid Injury! Diesel fuel is flammable! Extinguish all open flames before working on fuel system. Do not smoke

1. Park machine on level surface, shut engine off, engage park brake.
2. Allow machine and engine to cool before attempting to service fuel system.
3. Disconnect battery negative (-) cable.
4. Remove cowl panels and control panel. (See [Control Panel Removal and Installation](#) in Section 120, Group 10.)
5. Disconnect fuel sensor unit wiring leads (A). Note location of leads for later installation.
6. Remove the fuel sensor unit retainer (B).
7. Lift fuel gauge sensor out of fuel tank.

Installation:

- Installation is the reverse of removal.



LVAL11894—UN—02NOV10

A—Wiring Lead (2 used)

B—Retainer

- Inspect gasket. Replace if cracked or damaged.
- Install fuel gauge sensor retaining nut and terminal nuts to specifications.

Specification

Fuel Gauge Sensor	
Retaining Nut—Torque.....	25—30 N·m (18.4—22.1 lb-ft)
Fuel Gauge Sensor	
Terminal Nuts—Torque.....	3.4 N·m (30.0 lb-in.)

KN52281,10044C9 -19-16JAN13-1/1

Section 50 Electrical—EEC

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System Specifications

Item	Measurement	Specification
Battery:		
Battery	Voltage	12 VDC
BCI	Group	34
CCA Rating	Amps @ -18° C (0° F)	500
Reserve Capacity	Minutes	120
Load Test	Amps	325 for 15 seconds (minimum)
Starting Motor:		
Starting Motor	Type	Solenoid Shift
Draw (on machine)	Amps	300 (max.)
No-Load Draw (free running)	Amps	325 amps (max.) @ 4440 rpm
Starting Solenoid Pull-in	Amp Draw	55.5 (max)
Starting Solenoid Hold-in	Amp Draw	10.5 (max)
Alternator:		
Regulated	Voltage	14.3—14.8 VDC @ 25°C (77°F)
Unregulated	Voltage	50 VAC
Amperage	Amps	55
Fuel Shutoff Solenoid:		
Range	Voltage	6—16 VDC, 12 VDC Nominal
Pull-in Current	Amps	35 (maximum)
Hold-in Current	Amperage	0.3
Sensors:		
Engine Coolant Temperature	Resistance (variable)	22—520 ohms
Fuel Gauge	Resistance (variable)	8—89 ohms
Engine Oil Pressure Switch Closes (light ON to OFF)	Pressure	@ 40—75 kPa (5.8—10.8 psi)
Lighting:		
Headlights (halogen)	Watts	37.5
Tail/Turn Light	Type	1157
Hazard Lights	Type	1156
Work Lights (halogen)	Type	886
Torque Specifications:		
Alternator Positive Cable Nut	Torque	13.5 N·m (120 lb.-in.)
Position Sensor Lock Nut	Torque	5 N·m (44.25 lb.-in.)
Starting Solenoid Positive Cable Nut	Torque	13.5 N·m (120 lb.-in.)
Fuel Sensor Terminal Nuts	Torque	3.4 N·m (30.0 lb.-in.)
Load Center Mounting Nuts	Torque	7.5 N·m (66.3 lb.-in.)

Continued on next page

SW03989,0000D1E -19-05NOV10-1/2

Specifications

Item	Measurement	Specification
HST Drive Controller Connector Cap Screw	Torque	2.0 N·m (17.7 lb.-in.)
Neutral Start Switch	Torque	27 N·m (19.9 lb.-ft.)
MFWD Engagement Sensing Switch	Torque	27 N·m (19.9 lb.-ft.)
Mid PTO Switch	Torque	27 N·m (19.9 lb.-ft.)

SW03989,0000D1E -19-05NOV10-2/2

Essential or Recommended Tools

NOTE: Order tools from the SERVICEGARD™ Catalog.

ESSENTIAL TOOLS listed are required to perform the job correctly and are obtainable only from the SERVICEGARD™ Catalog.

SERVICEGARD is a trademark of Deere & Company

RECOMMENDED TOOLS, as noted, are suggested to perform the job correctly. Some tools may be available from local suppliers or may be fabricated.

SW03989,0000D1F -19-05NOV10-1/2

Weatherpack Extraction Tool..... JDG364	Probe Light..... JDG186
To remove contacts from weatherpack connectors.	To test for current continuity and grounds.
Electronic Control Analyzer..... JDG1575	Hydrometer.....NA
Test and adjust position sensors.	Used to check specific gravity of electrolyte in battery cells.
Electrical Circuit Analyzer..... JT07324A	Battery Tester (or Voltmeter).....JT05685
To diagnose key switch and associated electrical circuits.	Used to measure battery voltage.
Current Clamp-on ProbeJT02153	Current Gun.....JT05712
To diagnose current amperage with in electrical wires.	Used to measure alternator output current.
Analog/Digital Multimeter.....JT05791	Hand-Held Digital Tachometer.....JTO5719
To diagnose electrical system circuits and components.	Used to measure speed of starting motor.

SW03989,0000D1F -19-05NOV10-2/2

Other Materials

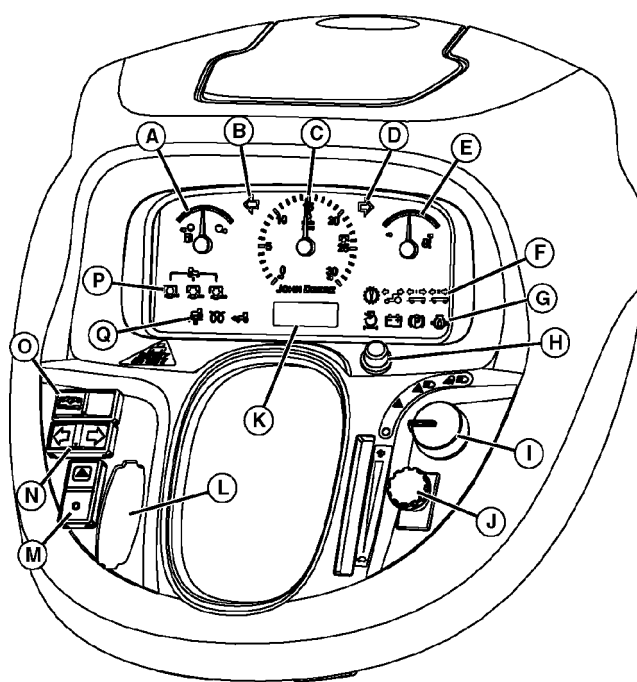
Number	Name	Use
TY9374/TY9375 (U.S.)	Pipe sealant with TEFLON™	Seal threads on temperature sensor and oil pressure switches.
NA (U.S.)	Bearing Puller Set	Used to remove pulley from alternator.
NA (U.S.)	400-grit Silicon Carbide Sandpaper	Used to polish slip rings.

TEFLON is a trademark of Du Pont Co.

SW03989,0000D20 -19-05NOV10-1/1

Display Panel

- | | |
|------------------------------------|------------------------------|
| A—Fuel Gauge | J—Rear and Mid PTO Switch |
| B—Left Turn Indicator Light | K—LCD Display Panel |
| C—Engine Tachometer | L—Reverser Shift Lever (PRT) |
| D—Right Turn Indicator Light | M—Load Match Switch |
| E—Engine Coolant Temperature Gauge | N—Turn Signal Switch |
| F—Bulb Integrity Indicator Lights | P—PTO Indicator Lights |
| G—Malfunction Indicator Lights | Q—Indicator Lights |
| H—Horn Switch | |
| I—Light Switch | |



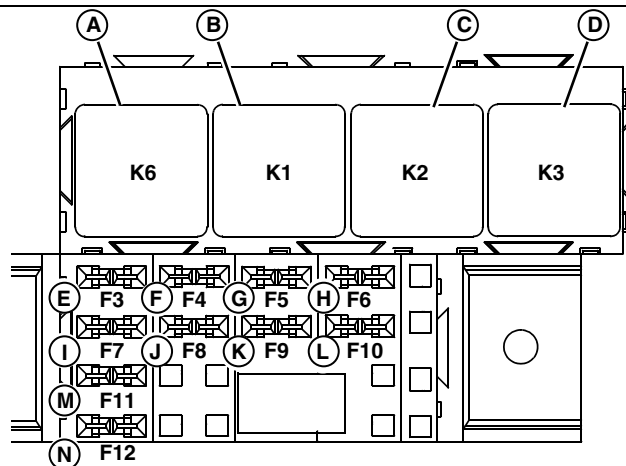
Display Panel

SW03989,0000D21 -19-05NOV10-1/1

LVAL11895 —UN—12NOV10

Load Center

- | | |
|----------------------------|---------------------------|
| A—K6—Brake Light Relay | I—F7—Fuse 20A |
| B—K1—Fuel Relay | J—F8—Fuse 20A |
| C—K2—Start Relay | K—F9—Fuse 20A (15A MY08) |
| D—K3—Manifold Heater Relay | L—F10—Fuse 20A (15A MY08) |
| E—F3—Fuse 30A | M—F11—Fuse 10A |
| F—F4—Fuse 30A (20A MY08) | N—F12—Fuse 20A (15A MY08) |
| G—F5—Fuse 30A | O—K4—Trailer Relay |
| H—F6—Fuse 20A | |



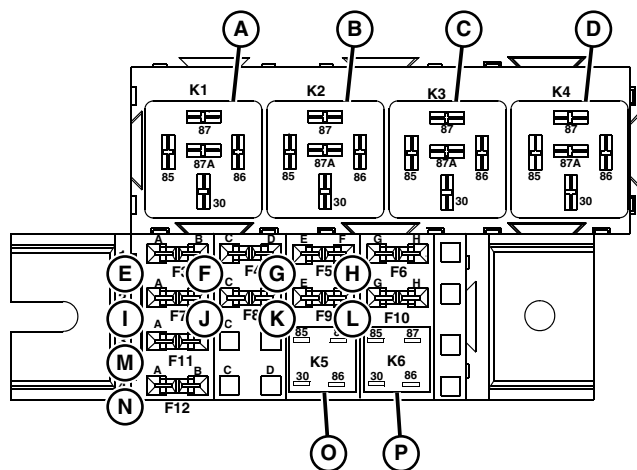
Load Center

SW03989,0000D22 -19-05NOV10-1/1

LVAL11896 —UN—12NOV10

Load Center—MY13

- | | |
|----------------------------|------------------------|
| A—K1—Fuel Relay | I— F7—Fuse 20A |
| B—K2—Start Relay | J— F8—Fuse 20A |
| C—K3—Manifold Heater Relay | K—F9—Fuse 15A |
| D—K4—Light Relay | L—F10—Fuse 15A |
| E—F3—Fuse 30A | M—F11—Fuse 10A |
| F—F4—Fuse 20A | N—F12—Fuse 15A |
| G—F5—Fuse 30A | O—K5—Trailer Relay |
| H—F6—Fuse 20A | P—K6—Brake Light Relay |



Load Center

LVAL40690 —UN—03DEC12

KN52281,1004520 -19-11JAN13-1/1

Main Schematic and Wiring Harness Legend—PRT and eHydro™ (Pre MY08)

Model Year 2007 Serial Number Breaks

Model	Transmission	Serial Number
3320	eHydro™	-435000
3320	PRT	-440000
3520	eHydro™	-470000
3520	PRT	-475000

Serial Number Breaks

Component Legend:

A1—Display Panel	F10—Fuse 20A
B1—Air Filter Restriction Switch	F11—Fuse 10A
B2—Engine Oil Pressure Switch	F12—Fuse 20A
B3—Engine Coolant Temperature Sensor	G1—Battery
B4—Fuel Gauge Sensor	G2—Alternator
E1—Left Headlight	H1—Horn
E2—Right Headlight	K1—Fuel Relay
E3—Left Work Light	K2—Start Relay
E4—Right Work Light	K3—Manifold Heater Relay
E5—Right Front Turn/Hazard Light	K4—Trailer Relay
E6—Right Front Marker Light	K5—Flasher Relay
E7—Right Rear Turn/Hazard Light	K6—Brake Relay
E8—Right Rear Marker Light	M1—Starting Motor
E9—Right Brake Light	M2—Brake Relay
E10—License Plate Light	R1—Manifold Heater
E11—Left Front Turn/Hazard Light	S1—Horn Switch
E12—Left Front Marker Light	S2—Key Switch
E13—Left Rear Turn/Hazard Light	S3—Light Switch
E14—Left Rear Marker Light	S4—Rear PTO Switch
E15—Left Brake Light	S5—Display Mode Switch
F1—Fusible Link	S7—Rear PTO Engagement Sensing Switch
F2—Fusible Link	S8—Seat Switch
F3—Fuse 30A	S9—Mid PTO Switch (optional)
F4—Fuse 30A	S10—MFWD Engagement Sensing Switch
F5—Fuse 30A	S11—Transmission Neutral Switch (PRT)
F6—Fuse 20A	S12—Park Brake Switch
F7—Fuse 20A	S13—Hazard Lights Switch
F8—Fuse 20A	S14—Turn Signal Switch
F9—Fuse 20A	S15—Brake Switch
	S21—Front PTO Switch
	W1—Battery/Frame Ground
	Y1—Starting Motor Solenoid
	Y2—Fuel Shutoff Solenoid
	Y3—Rear PTO Solenoid
	Y6—Front PTO Clutch

Connectors:

X1—W1 Main Wiring Harness to Y2 Fuel Shutoff Solenoid

Continued on next page

SW03989,0000D23 -19-05NOV10-1/2

X2—W1 Main Wiring Harness to R1 Manifold Heater
 X3—W1 Main Wiring Harness to W2 Headlight/Horn Wiring Harness
 X4—W1 Main Wiring Harness to W9 Wiring Harness
 X5—W1 Main Wiring Harness to W9 Wiring Harness
 X6—W1 Main Wiring Harness to A1 Display Panel
 X7—W1 Main Wiring Harness to A1 Display Panel
 X8—W1 Main Wiring Harness to W3 Jumper Plug (standard), S9 Mid PTO Switch (optional)
 X9—W1 Main Wiring Harness to S11 Transmission Neutral Switch (PRT), W4 Jumper Plug eHydro™
 X10—W1 Main Wiring Harness to A1 Display Panel
 X11—W1 Main Wiring Harness to A1 Display Panel
 X12—W1 Main Wiring Harness to W9 Wiring Harness
 X13—W1 Main Wiring Harness Trailer Connector
 X14—W1 Main Wiring Harness to W5 Left Work Light Wiring Harness (optional)
 X15—W1 Main Wiring Harness to W5 Left Work Light Wiring Harness (optional)
 X16—W1 Main Wiring Harness to W6 Right Work Light Wiring Harness (optional)
 X17—W1 Main Wiring Harness to W6 Right Work Light Wiring Harness (optional)
 X18—W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness
 X19—W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness
 X20—W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness
 X21—W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness

eHydro is a trademark of Deere & Company

X22—W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness
 X23—W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness
 X24—W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness
 X25—W1 Main Wiring Harness to E10 License Plate Light
 X26—W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
 X27—W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
 X28—W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
 X29—W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
 X30—W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
 X31—W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
 X32—W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness

Wiring Harnesses:

W1—Main Wiring Harness
 W2—Headlight/Horn Wiring Harness
 W3—Jumper Plug
 W4—Jumper Plug
 W5—Right Work Light Wiring Harness (optional)
 W6—Left Work Light Wiring Harness (optional)
 W7—Left Rear Lights Wiring Harness
 W8—Right Rear Lights Wiring Harness

SW03989,0000D23 -19-05NOV10-2/2

eHydro™—Schematic and Wiring Harness Legend

A2—Electronic Drive Controller

H2—Backup Alarm

S16—Load Match Switch

S17—Res/+, Set/- Switch (optional)

S18—Cruise Control/Max Speed Switch (optional)

S19—Motion Match Switch (optional)

S20—Cruise Control Switch (standard)

T1—Forward Pedal Sensor

T2—Throttle Position Sensor

T3—MFWD Speed Sensor

T4—Reverse Pedal Sensor

Y4—Reverse Proportional Solenoid

Y5—Forward Proportional Solenoid

Connectors:

X33—W9 Wiring Harness to A2 Electronic Drive Controller

X34—W9 Wiring Harness to W10 Proportional Valve Wiring Harness

X35—W9 Wiring Harness to W11 Cruise Control Wiring Harness (standard)

X35—W9 Wiring Harness to W12 Cruise Control Wiring Harness (optional)

X36—W9 Wiring Harness to T1 Forward Pedal Sensor

X37—W9 Wiring Harness to T2 Throttle Position Sensor

X38—W9 Wiring Harness to T3 MFWD Speed Sensor

X39—W9 Wiring Harness to T4 Reverse Pedal Sensor

Wiring Harnesses:

W9—Wiring Harness

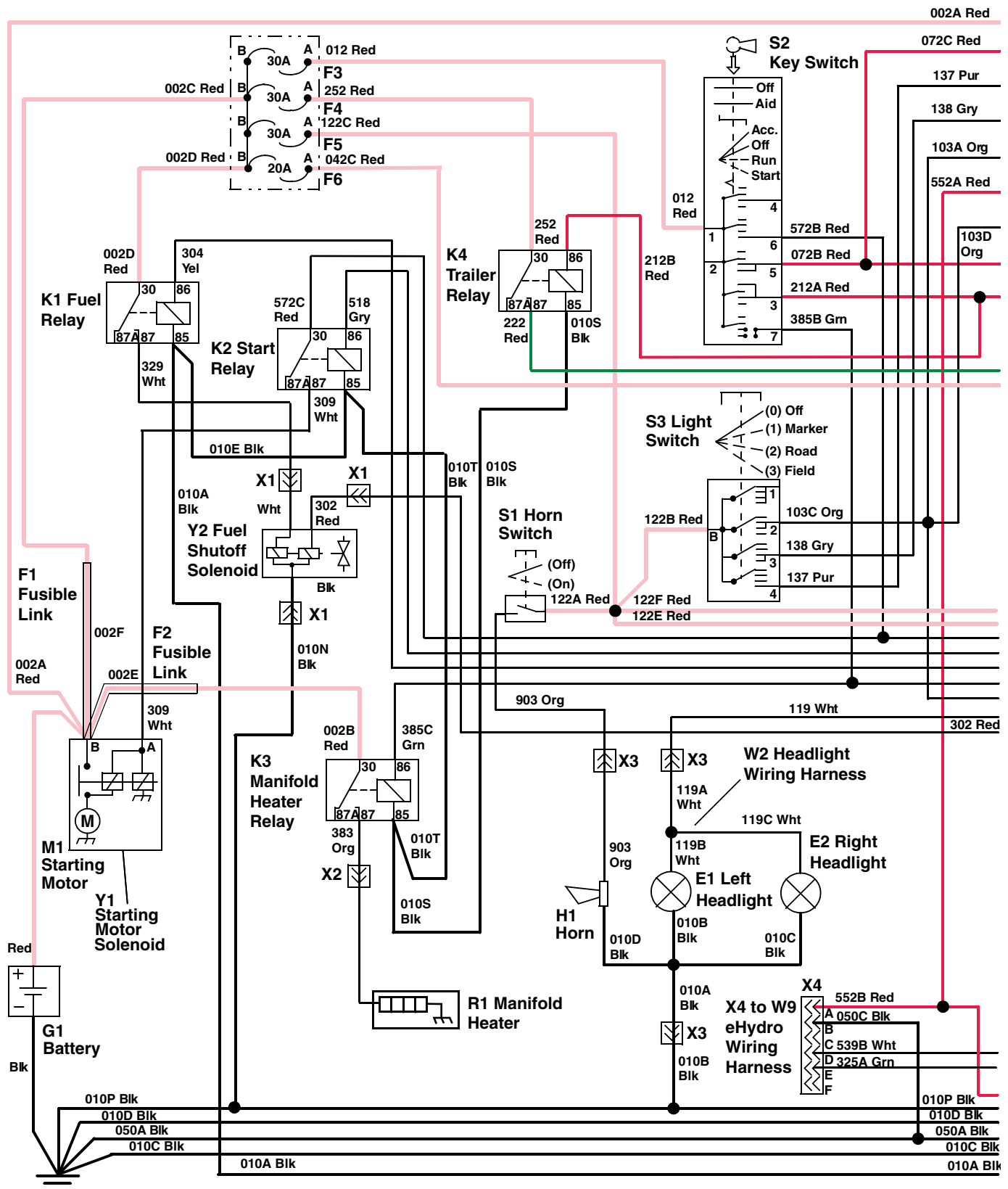
W10—Proportional Valve Wiring Harness

W11—Cruise Control Wiring Harness (standard)

W12—Cruise Control Wiring Harness (optional)

SW03989,0000D24 -19-05NOV10-1/1

Main Electrical Schematic (Pre MY08)



_VAL11897 —UN—12NOV10

Main Electrical Schematic

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SW03989,0000D25 -19-05NOV10-1/10

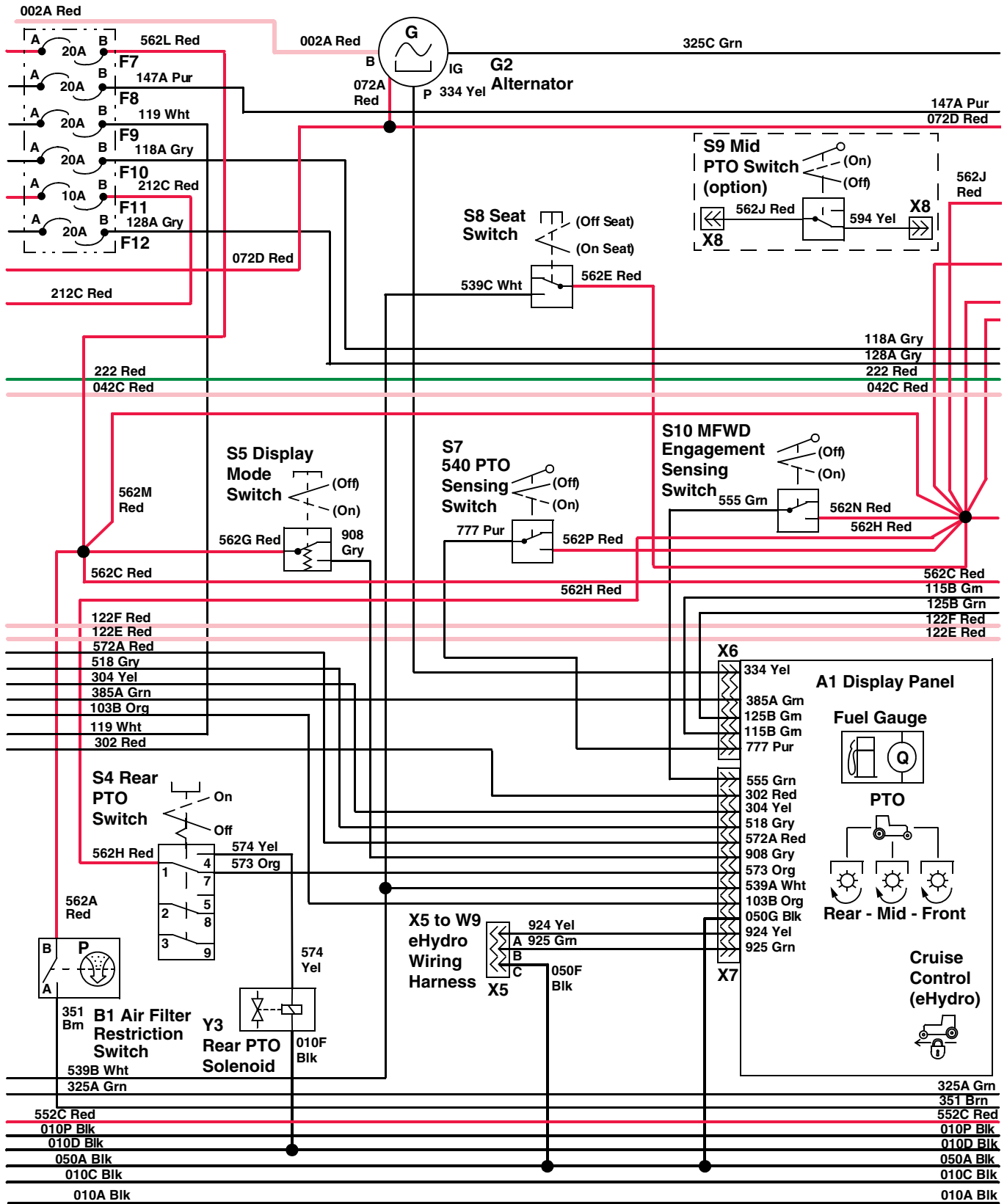
Schematics and Harnesses

E1—Left Headlight	K2—Start Relay	X1—W1 Main Wiring Harness to	Y1—Starting Motor Solenoid
E2—Right Headlight	K3—Manifold Heater relay	Y2 Fuel Shutoff Solenoid	Y2—Fuel Shutoff Solenoid
F1—Fusible Link	K4—Trailer Relay	X2—W1 Main Wiring Harness to	
F2—Fusible Link	M1—Starting Motor	R1 Manifold Heater	
F3—Fusible Link	R1—Manifold Heater	X3—W1 Main Wiring Harness to	
F4—Fuse 30A	S1—Horn Switch	W2 Headlight/Horn Wiring	
F5—Fuse 30A	S2—Key Switch	Harness	
F6—Fuse 20A	S3—Light Switch	X4—W1 Main Wiring Harness	
G1—Battery	W2—Headlight Wiring harness	to W9 eHydro™ Wiring	
H1—Horn		Harness	
K1—Fuel Relay			

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SW03989,0000D25 -19-05NOV10-2/10



Main Electrical Schematic

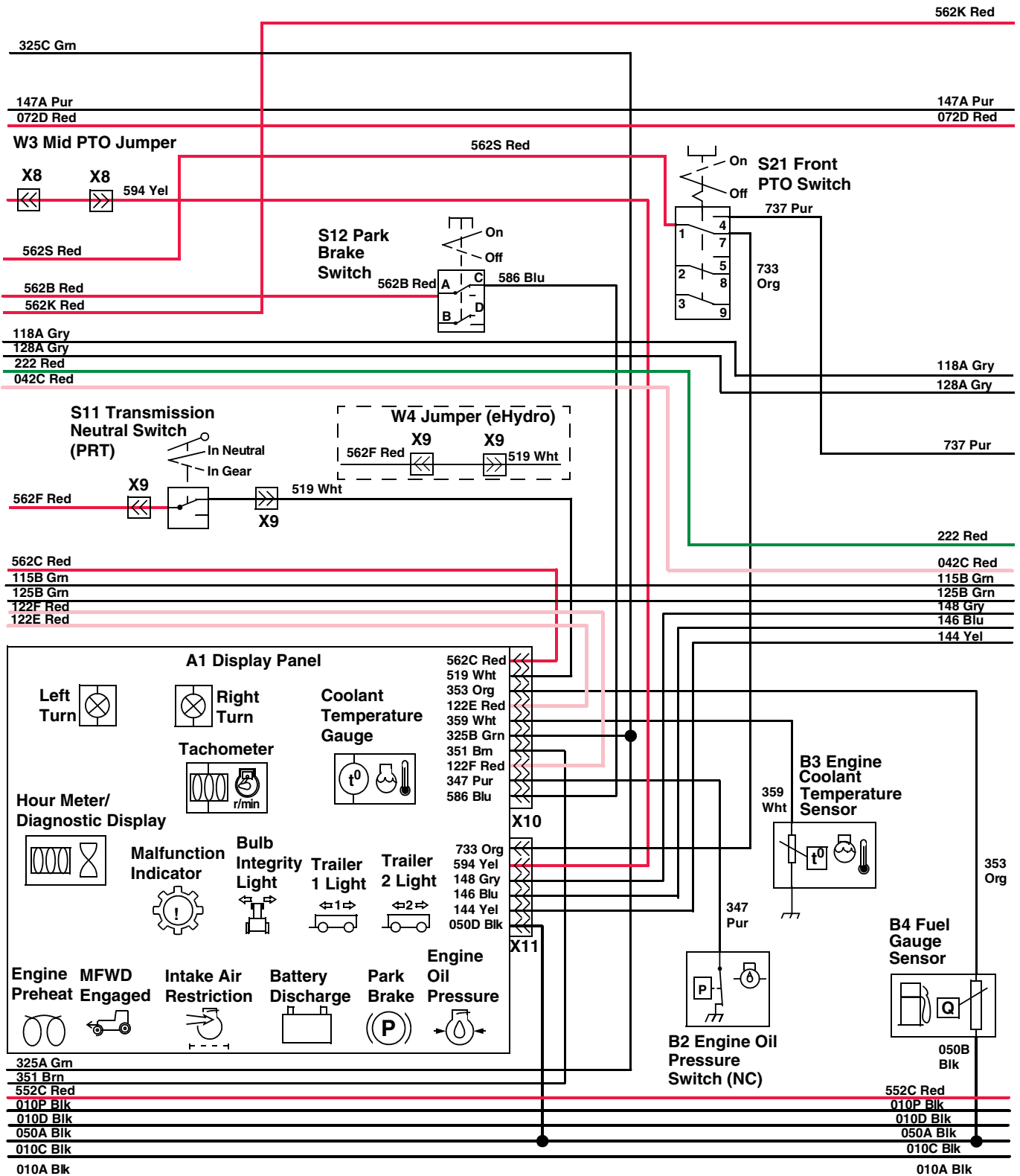
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SW03989,0000D25 -19-05NOV10-3/10

A1—Display panel	S4—Rear PTO Switch	X5—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X8—W1 Main Wiring Harness to W3 Jumper Plug (standard), S9 Mid PTO Switch (optional)
B1—Air Filter Restriction Switch	S5—Display Mode Switch		
F7— Fuse 20A	S7—Rear PTO Engagement Sensing Switch	X6—W1 Main Wiring Harness to A1 Display Panel	Y3—Rear PTO Solenoid
F8— Fuse 20A	S8—Seat Switch	X7—W1 Main Wiring Harness to A1 Display Panel	
F9— Fuse 20A	S9—Mid PTO Switch (optional)		
F10— Fuse 20A	S10— MFWD Engagement Sensing Switch		
F11— Fuse 10A			
F12— Fuse 20A			
G2—Alternator			

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SW03989,0000D25 -19-05NOV10-4/10



Main Electrical Schematic

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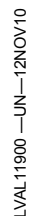
SW03989,0000D25 -19-05NOV10-5/10

Schematics and Harnesses

A1—Display Panel	S11— Transmission Neutral	X8— W1 Main Wiring Harness to
B2—Engine Oil Pressure Switch	Switch (PRT)	W3 Jumper Plug (standard),
B3—Engine Coolant Temperature	S12— Park Brake Switch	S9 Mid PTO Switch (optional)
Sensor	S21— Front PTO Switch	X9— W1 Main Wiring Harness to
B4—Fuel Gauge Sensor	W3—Jumper Plug	S11 Transmission Neutral
	W4—Jumper Plug (eHydro™)	Switch (PRT), W4 Jumper
		Plug (eHydro™)

Continued on next page

SW03989,0000D25 -19-05NOV10-6/10



Main Electrical Schematic

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SW03989,0000D25 -19-05NOV10-7/10

Schematics and Harnesses

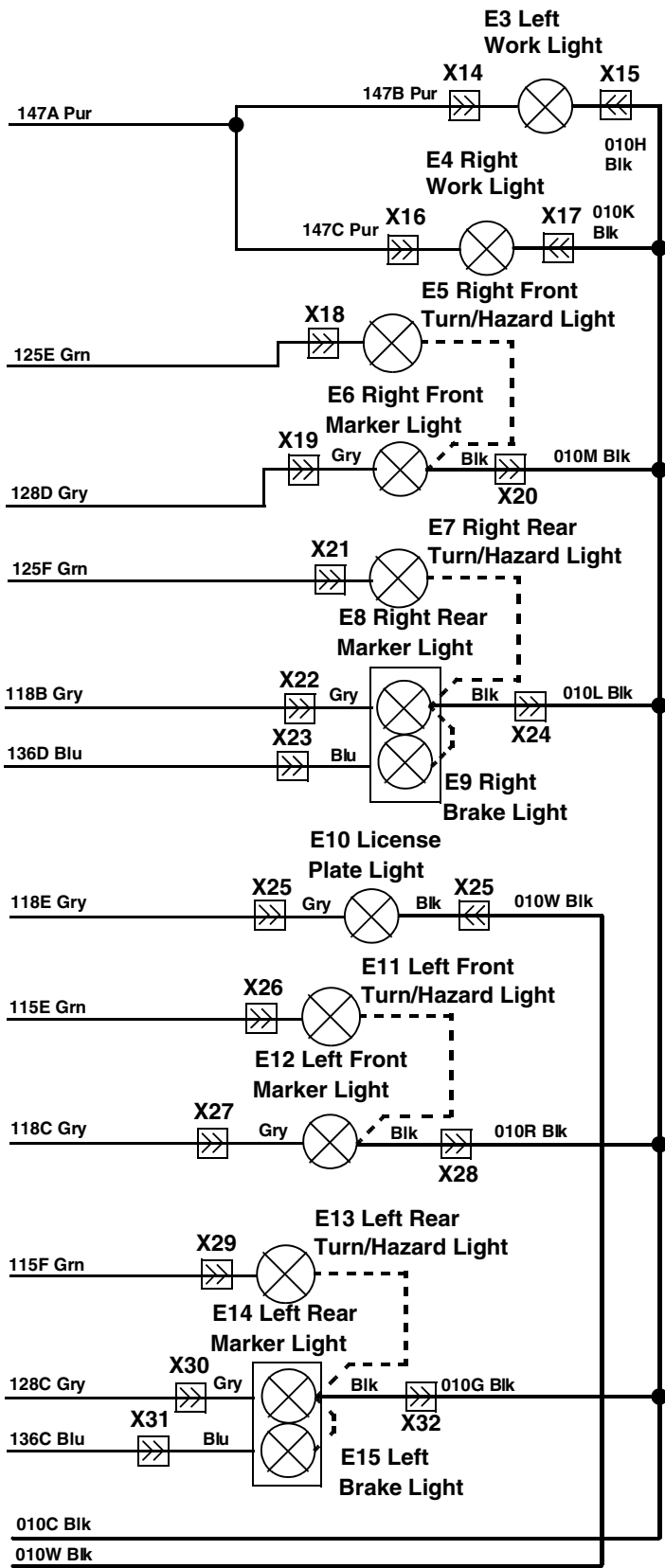
K5—Flasher Relay
K6—Brake Light Relay
M2—Fuel Pump
S13— Hazard Lights Switch

S14— Turn Signal Switch
S15— Brake Switch
W9—eHydro™ Wiring Harness

X12 — W1 Main Wiring Harness to W9 eHydro™ Wiring Harness
X13— W1 Main Wiring Harness Trailer Connector
Y6—Front PTO Clutch

Continued on next page

SW03989,0000D25 -19-05NOV10-8/10



Main Electrical Schematic

LVAL11901 —UN—12NOV10

Continued on next page

SW03989,0000D25 -19-05NOV10-9/10

E3— Left Work Light	X15— W1 Main Wiring Harness to W5 Left Work Light Wiring Harness (optional)	X21— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X28— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E4— Right Work Light	X16— W1 Main Wiring Harness to W6 Right Work Light Wiring Harness (optional)	X22— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X29— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E5— Right Front Turn/Hazard Light	X17— W1 Main Wiring Harness to W6 Right Work Light Wiring Harness (optional)	X23— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X30— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E6— Right Front Marker Light	X18— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X24— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X31— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E7— Right Rear Turn/Hazard Light	X19— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X25— W1 Main Wiring Harness to E10 License Plate Light	X32— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E8— Right Rear Marker Light	X20— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X26— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
E9— Right Brake Light		X27— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
E10— License Plate Light			
E11— Left Front Turn/Hazard Light			
E12— Left Front Marker Light			
E13— Left Rear Turn/Hazard Light			
E14— Left Rear marker Light			
E15— Left Brake light			
X14— W1 Main Wiring Harness to W5 Left Work Light Wiring Harness (optional)			

SW03989,0000D25 -19-05NOV10-10/10

W1 Main Wiring Harness (Pre MY08)**Model Year (Pre MY08) Serial Number Breaks**

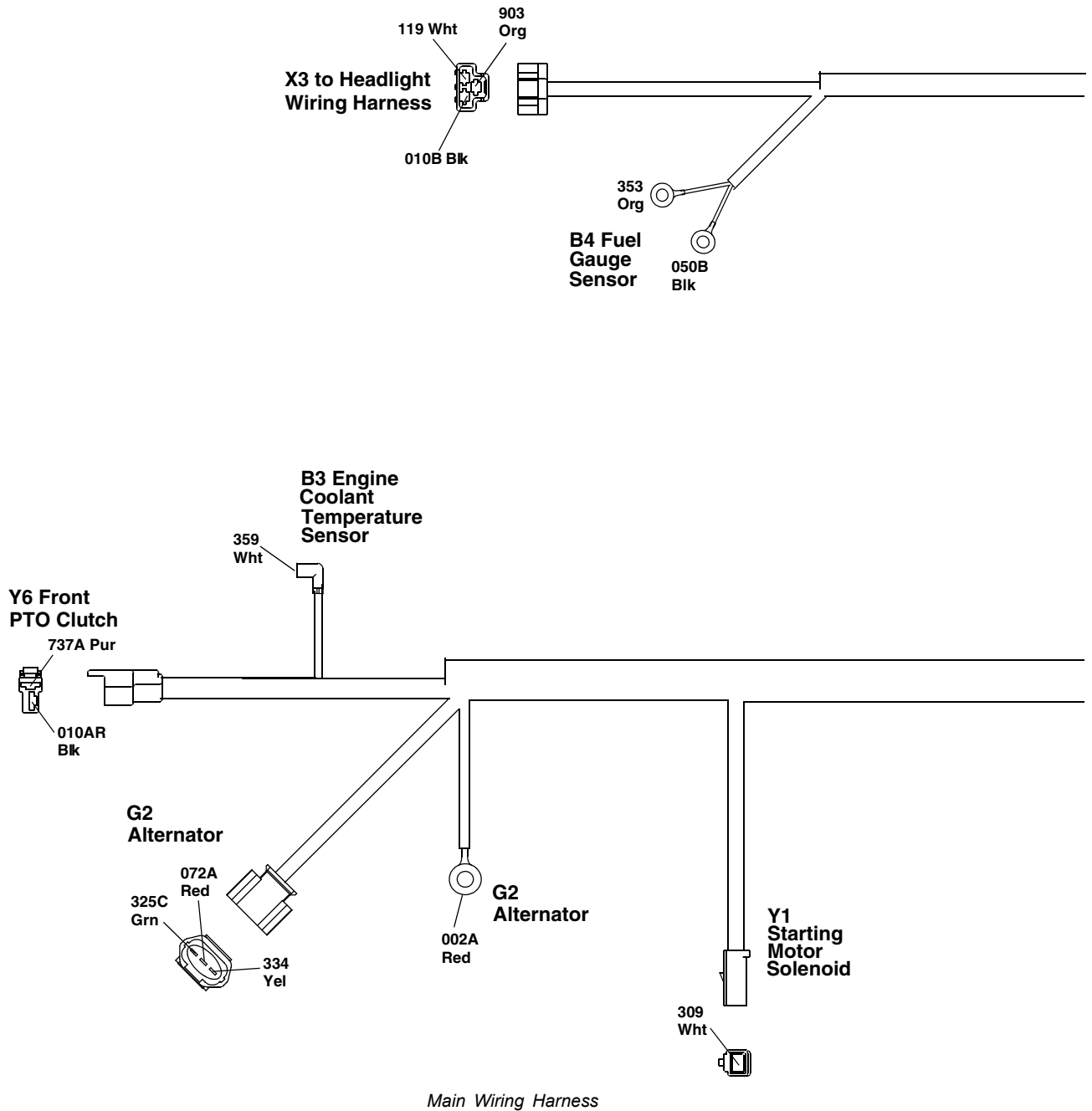
Model	Transmission	Serial Number
3320	eHydro™	-435000
3320	PRT	-440000
3520	eHydro™	-470000
3520	PRT	-475000

Serial Number Breaks

Continued on next page

SW03989,0000D26 -19-05NOV10-1/6

Model	Transmission	Serial Number
3320	eHydro	-435000
3320	PRT	-440000
3520	eHydro	-470000
3520	PRT	-475000



LVAL11902 —UN—12NOV10

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SW03989,0000D26 -19-05NOV10-2/6

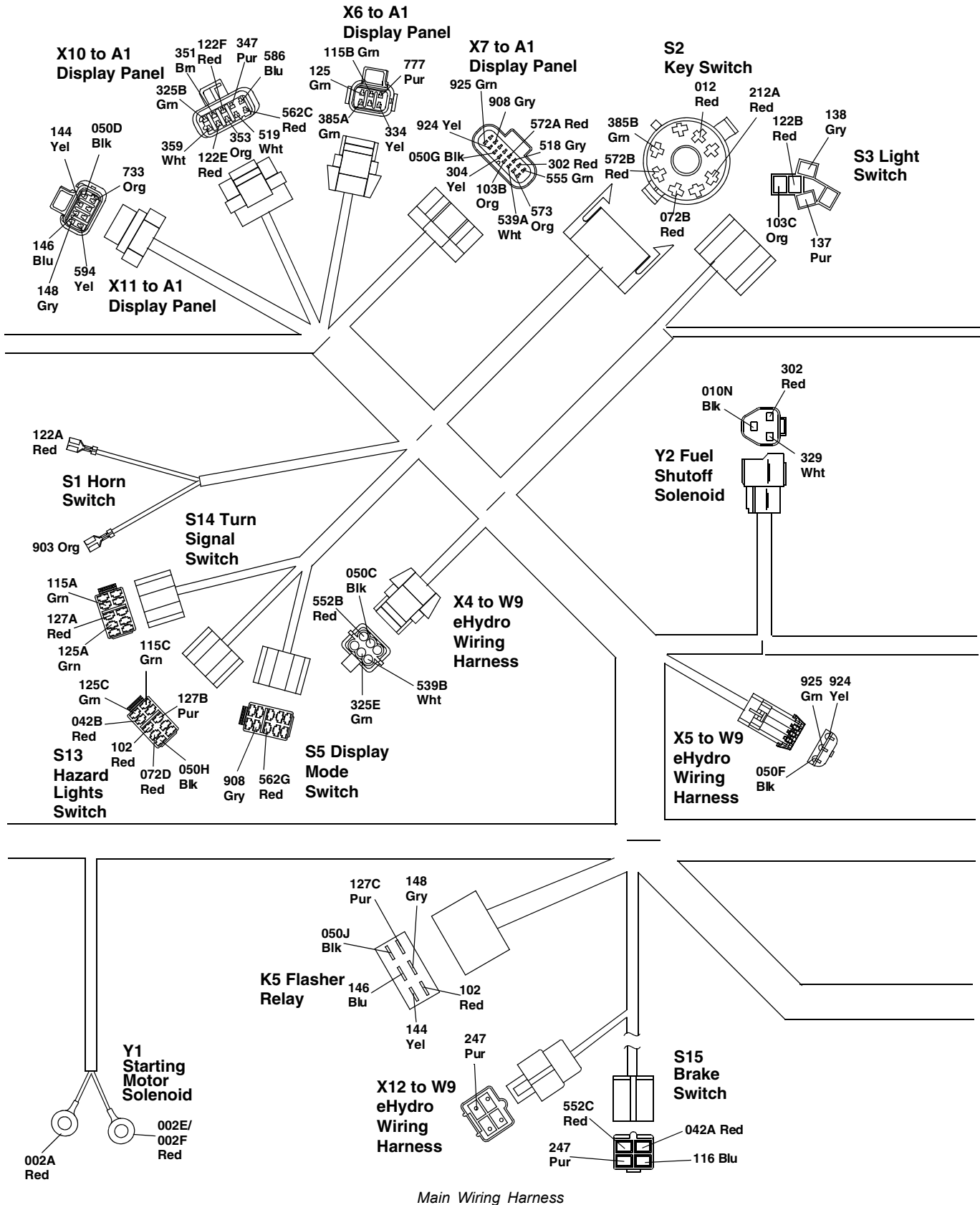
Schematics and Harnesses

B3—Engine Coolant Temperature Sensor
G2—Alternator
Y1— Starting Motor Solenoid
B4—Fuel Gauge Sensor
X3— To Headlight Wiring Harness
Y6— Front PTO Clutch

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SW03989,0000D26 -19-05NOV10-3/6



LVAL11903—UN—12NOV10

Continued on next page

SW03989,0000D26 -19-05NOV10-4/6

A1—Display Panel
K5—Flasher Relay
S1—Horn Switch
S2—Key Switch
S3—Light Switch
S13—Hazard Lights Switch
S14—Turn Signal Switch
S15—Brake Switch
W9—eHydro Wiring Harness

X4—W1 Main Wiring Harness
to W9 eHydro™ Wiring
Harness
X5—W1 Main Wiring Harness
to W9 eHydro™ Wiring
Harness
X6—W1 Main Wiring Harness to
A1 Display Panel

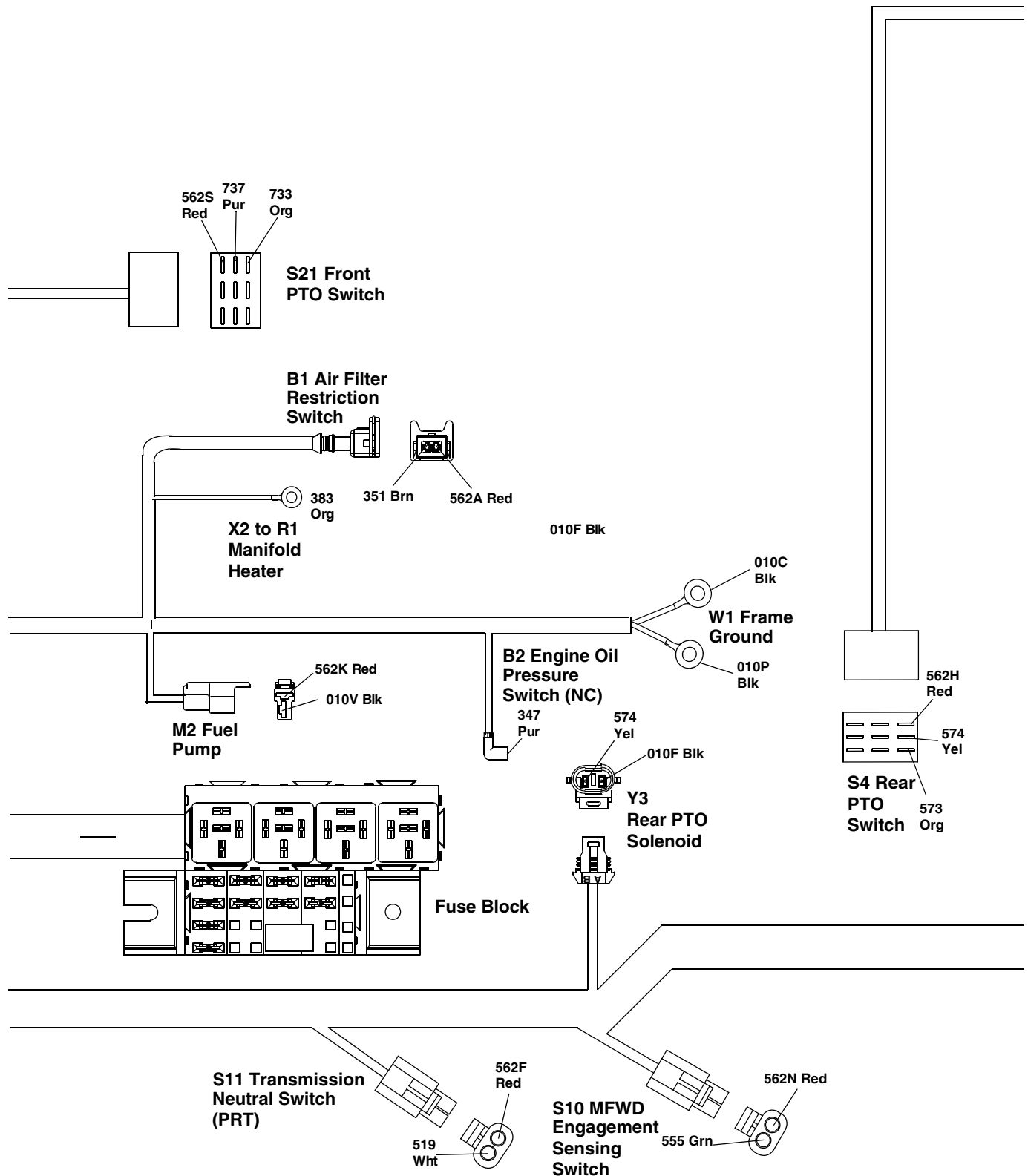
X7—W1 Main Wiring Harness to
A1 Display Panel
X10—W1 Main Wiring Harness
to A1 Display Panel
X11—W1 Main Wiring Harness
to A1 Display Panel
X12—W1 Main Wiring Harness
to W9 eHydro™ Wiring
Harness

Y1—Starting Motor Solenoid
Y2—Fuel Shutoff Solenoid

eHydro is a trademark of Deere & Company

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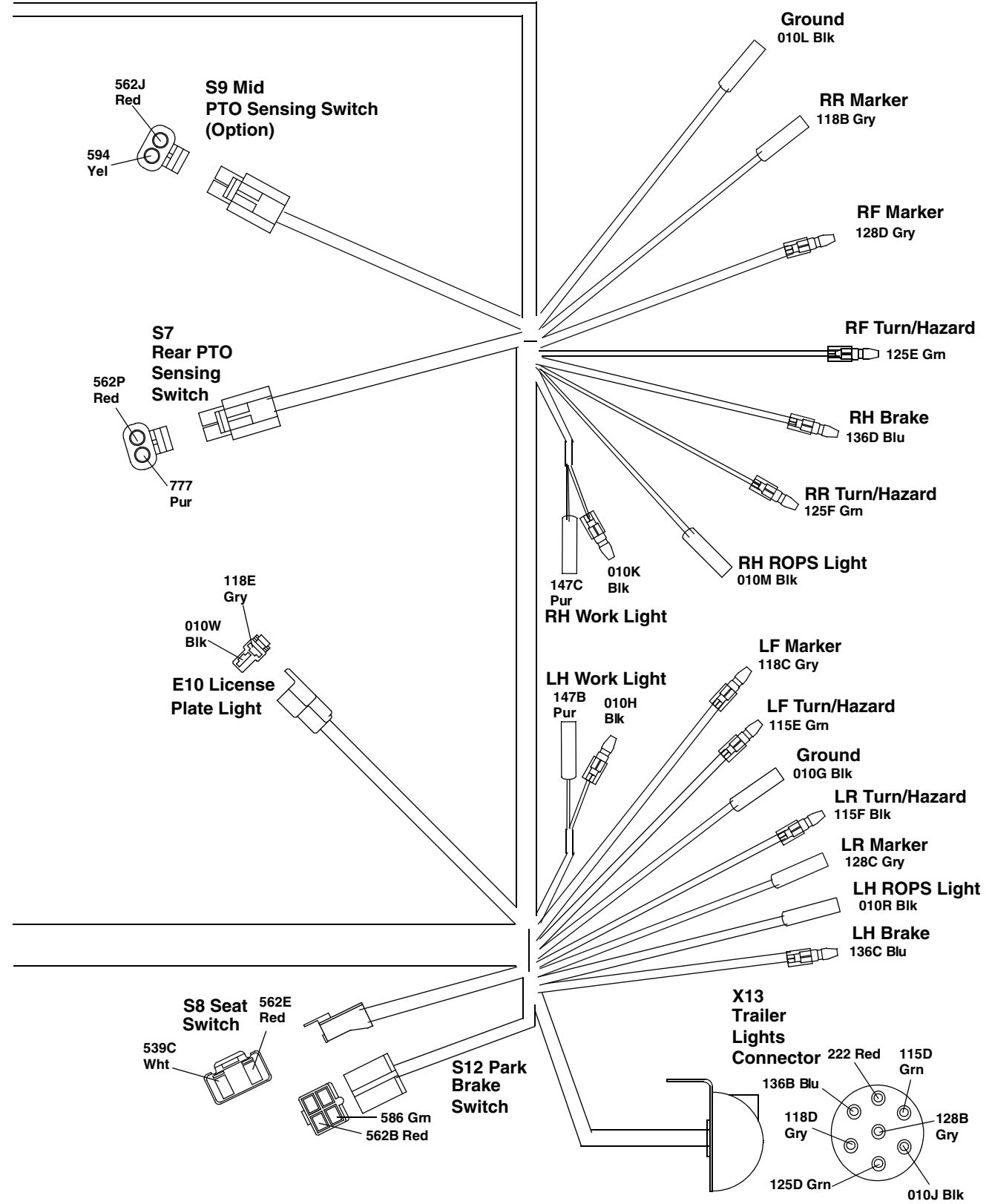
SW03989,0000D26 -19-05NOV10-5/6



- | | | | |
|------------------------------------|---------------------------------------|---|----------------------|
| B1—Air Filter Restriction Switch | S4—Rear PTO Switch | S21—Front PTO Switch | Y3—Rear PTO Solenoid |
| B2—Engine Oil pressure Switch (NC) | S10—MFWD Engagement Sensing Switch | W1—Frame ground | |
| M2—Fuel Pump | S11—Transmission Neutral Switch (PRT) | X2—W1 Main Wiring Harness to R1 Manifold Heater | |

SW03989,0000D26 -19-05NOV10-6/6

LVAL11904—UN—12NOV10



Main Wiring Harness

E10— License Plate Light S8— Seat Switch S12— Park Brake Switch
 S7— Rear PTO Sensing Switch S9— Mid PTO Sensing Switch X13— Trailer Lights Switch

LVAL11905 —UN—12NOV10

SW03989,0000D26 -19-05NOV10-7/6

W1 Main Wiring Harness Color Codes (Pre MY08)

Size/No./Color	Wire Connection Points
5.0 002A Red	Y1, G2
5.0 002B Red	F2 Fusible Link, K3
5.0 002C Red	F1 Fusible Link, Fuse Block (F4)
5.0 002D Red	Fuse Block (F6), K1
2.0 002E	F2 Fusible Link
2.0 002F	F1 Fusible Link
0.5 010A Blk	K1, K6
1.3 010AR Blk	Y6, Splice
1.3 010B Blk	Splice, X3
3.0 010C Blk	W1, Splice
1.3 010D Blk	W1, Splice
0.5 010E Blk	K2, K1
0.8 010F Blk	Splice, Y3
0.8 010G Blk	Splice, X32
1.3 010H Blk	Splice, X15
2.0 010J Blk	Splice, X13
1.3 010K Blk	Splice, X17
1.0 010L Blk	Splice, X24
1.0 010M Blk	Splice, X20
3.0 010N Blk	Splice, X1
3.0 010P Blk	W1, Splice
0.8 010R Blk	Splice, X28
0.5 010S Blk	K3, K4
0.5 010T Blk	K2, K3
0.5 010U Blk	Splice, K6
1.3 010V Blk	M2, Splice
0.8 010W Blk	Splice, X25
3.0 012 Red	Fuse Block (F4), S2
1.3 042A Red	S15, Splice
1.3 042B Red	S13, Splice
1.3 042C Red	Fuse Block (F6), Splice
1.3 042D Red	K6, Splice
2.0 050A Blk	W1, Splice
0.5 050B Blk	Splice, B4
0.8 050C Blk	Splice, X4
0.8 050D Blk	Splice, X11
0.8 050F Blk	Splice, X5
0.8 050G Blk	Splice, X7
1.3 050H Blk	Splice, S13
1.3 050J Blk	Splice, K5
0.8 072A Red	Splice, G2
1.3 072B Red	S2, Splice
1.3 072C Red	Splice, Fuse Block (F7)
1.3 072D Red	Splice, S13
1.3 102 Red	S13, K5
1.3 103A Org	Fuse Block (F10), Splice
0.8 103B Org	Splice, X7
0.8 103C Org	Splice, S3
1.3 103D Org	Splice, Fuse Block (F12)
1.3 115A Grn	S14, Splice

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SW03989,0000D27 -19-09NOV10-1/3

Size/No./Color	Wire Connection Points
0.5 115B Grn	Splice, X6
0.8 115C Grn	Splice, S13
1.3 115D Grn	Splice, X13
0.8 115E Grn	Splice, X26
0.8 115F Grn	Splice, X29
0.8 116A Blu	S15, K6
1.3 118A Gry	Fuse Block (F10), Splice
0.8 118B Gry	Splice, X22
0.8 118C Gry	Splice, X27
1.3 118D Gry	Splice, X13
0.8 118E Gry	Splice, X25
1.3 119 Wht	Fuse Block (F9), X3
1.3 122A Red	Splice, S1
3.0 122B Red	Splice, S3
3.0 122C Red	Fuse Block (F5), Splice
1.3 122E Red	Splice, X10
1.3 122F Red	Splice, X10
1.3 125A Grn	S14, Splice
0.5 125B Grn	Splice, X6
0.8 125C Grn	Splice, S13
1.3 125D Grn	Splice, X13
0.8 125E Grn	Splice, X18
0.8 125F Grn	Splice, X21
1.3 127A Pur	S14, Splice
1.3 127B Pur	Splice, S13
1.3 127C Pur	Splice, K5
1.3 128A Gry	Fuse Block (F12), Splice
1.3 128B Gry	Splice, X13
0.8 128C Gry	Splice, X30
0.8 128D Gry	Splice, X19
2.0 136A Blu	K6, Splice
1.3 136B Blu	Splice, X13
0.8 136C Blu	Splice, X31
0.8 136D Blu	Splice, X23
1.3 137 Pur	Fuse Block (F8), S3
2.0 138 Gry	Fuse Block (F9), S3
0.8 144 Yel	X11, K5
0.8 146 Blu	X11, K5
2.0 147A Pur	Fuse Block (F8), Splice
1.3 147B Pur	Splice, X14
1.3 147C Pur	Splice, X16
0.8 148 Gry	X11, K5
1.3 212A Red	S2, Splice
0.5 212B Red	Splice, K4
1.3 212C Red	Splice, Fuse Block (F11)
2.0 222 Red	K4, X13
0.5 247 Pur	S15, X12
1.3 252 Red	Fuse Block (F4), K4
1.3 302 Red	X1, X7
0.5 304 Yel	K1, X7
2.0 309 Wht	K2, Y1
0.8 325A Grn	Splice, X4

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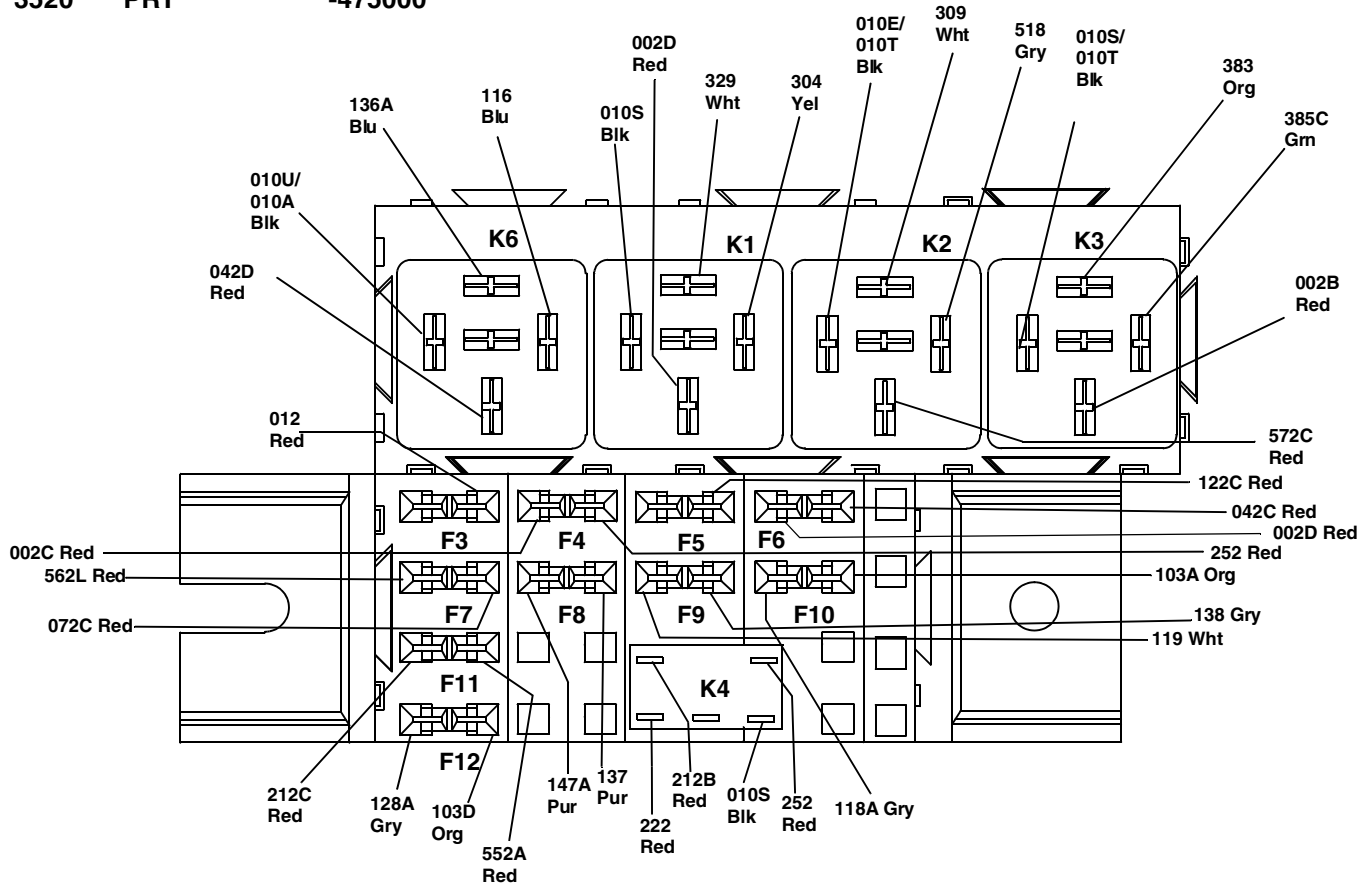
SW03989,0000D27 -19-09NOV10-2/3

Size/No./Color	Wire Connection Points
0.8 325B Grn	Splice, X10
0.8 325C Grn	G2, Splice
3.0 329 Wht	K1, X1
0.8 334 Yel	G2, X6
0.5 347 Pur	B2, X10
0.5 351 Brn	B1, X10
0.5 353 Org	B4, X10
0.5 359 Wht	B3, X10
2.0 383 Org	K3, X2
0.8 385A Grn	Splice, X6
0.8 385B Grn	S2, Splice
0.8 385C Grn	Splice, K3
0.5 518 Gry	X7, K2
0.5 519 Wht	X9, X10
0.5 539A Wht	Splice, X7
0.5 539B Wht	Splice, X4
0.5 539C Wht	S8, Splice
0.5 552A Red	Fuse Block (F11), Splice
0.5 552B Red	Splice, X4
0.5 552C Red	Splice, S15
0.5 555 Grn	S10, X7
0.5 562A Red	Splice, B1
0.5 562B Red	Splice, S12
0.8 562C Red	Splice, X10
0.5 562E Red	Splice, S8
0.5 562F Red	Splice, X9
0.5 562G Red	Splice, S5
0.8 562H Red	Splice, S4
0.5 562J Red	Splice, X8
0.8 562K Red	Splice, M2
1.3 562L Red	Fuse Block (F7), Splice
0.8 562M Red	Splice, Splice
0.8 562N Red	Splice, S10
0.5 562P Red	Splice, S7
0.8 562K Red	Splice, S21
0.8 572A Red	Splice, X7
1.3 572B Red	S2, Splice
1.3 572C Red	Splice, K2
0.5 573 Org	S4, X7
0.8 574 Yel	S4, Y3
0.5 586 Blu	S12, X10
0.5 594 Yel	X8, X11
0.8 733 Org	X7, S21
0.8 737 Pur	S21, Y6
0.5 777 Pur	X6, S7
0.8 903 Org	S1, X3
0.5 908 Gry	S5, X7
0.5 924 Yel	X5, X7
0.5 925 Grn	X5, X7

SW03989,0000D27 -19-09NOV10-3/3

Load Center—Pre MY08

Model	Transmission	Serial Number
3320	eHydro	-435000
3320	PRT	-440000
3520	eHydro	-470000
3520	PRT	-475000



Serial Number Breaks—Pre MY08

Model	Transmission	Serial Number
3320	eHydro™	-435000
3320	PRT	-440000
3520	eHydro™	-470000
3520	PRT	-475000

LVAL11906—UN—12NOV10

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SW03989,0000D28 -19-05NOV10-1/2

Component	Function
K1	Fuel Supply Relay
K2	Start Relay
K3	Manifold Heater Relay
K4	Trailer Relay
K5	Flasher Relay
K6	Brake Light Relay
F3	Key Switch Fuse
F4	Trailer Relay Fuse
F5	Horn and Light Switch Fuse
F6	Brake and Hazard Lights Fuse
F7	Switched Power Fuse
F8	Work Lights Fuse
F9	Head Lights Fuse
F10	Marker, License Plate Lights and Left Hazard Lights Fuse
F11	Harness Fuse
F12	Turn and Right Hazard Lights Fuse

Load Center

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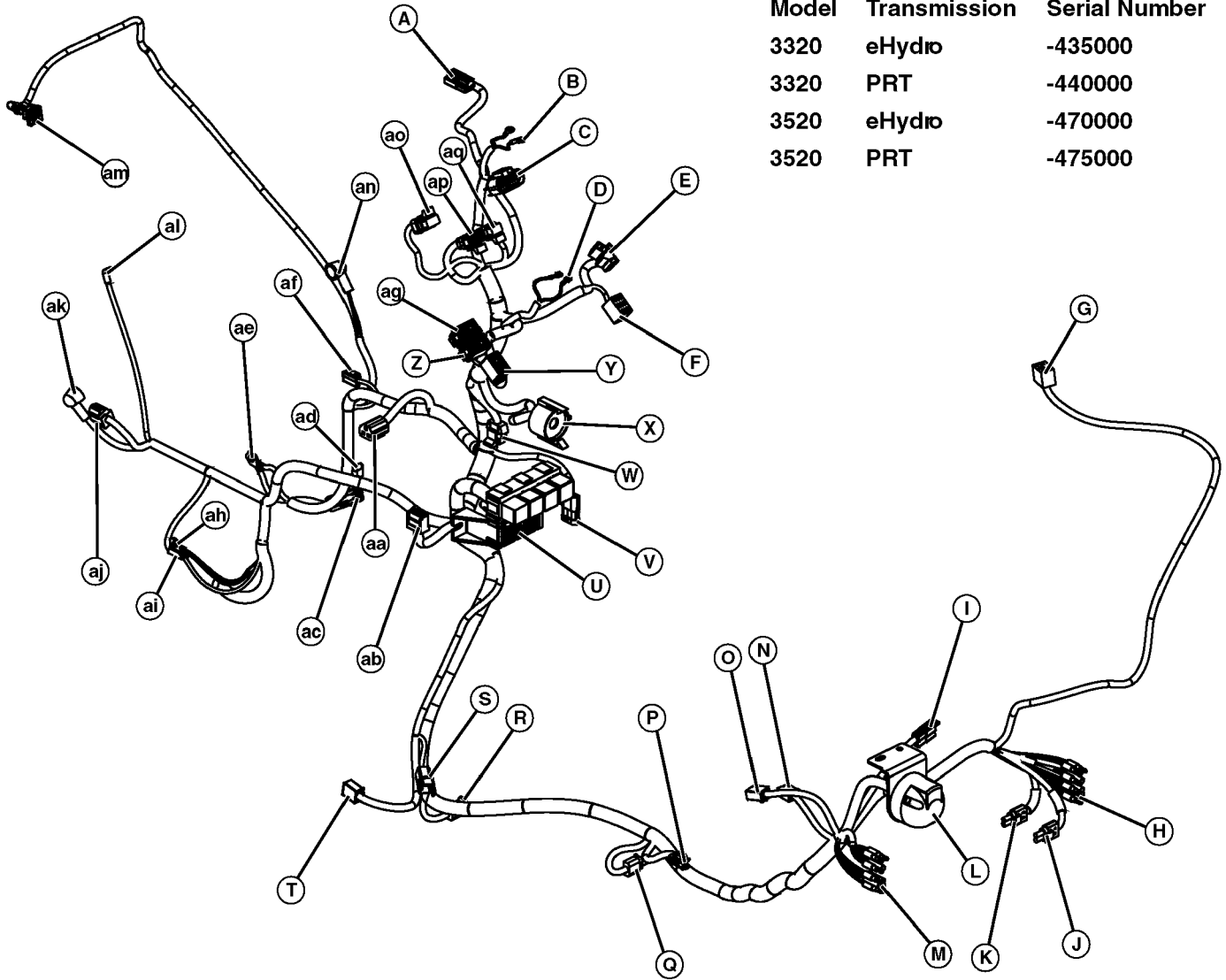
SW03989,0000D28 -19-05NOV10-2/2

W1 Main Wiring Harness Component Location (Pre MY08)

Model	Transmission	Serial Number
3320	eHydro™	-435000
3320	PRT	-440000
3520	eHydro™	-470000
3520	PRT	-475000

Serial Number Breaks—Pre MY08

Model	Transmission	Serial Number
3320	eHydro	-435000
3320	PRT	-440000
3520	eHydro	-470000
3520	PRT	-475000



Main Wiring Harness Component Location

LVAL11907 —UN—12NOV10

Continued on next page

SW03989,0000D29 -19-05NOV10-1/2

A—X3 Connector to W2 Headlight Wiring Harness	L—X13 Trailer Connector	U—Load Center	AH—Y1 Starting Motor Solenoid Battery+
B—B4 Fuel Gauge Sensor	M—LH Tail/Warning Light	V—X5 Diagnostic Interface	AI— Y1 Starting Motor Solenoid
C—X6 to A1 Display Panel	Connectors to W7 Left Rear Lights Wiring Harness	Connector or to W9 eHydro™ Wiring Harness	AJ—G2 Alternator
D—S1 Horn Switch	N—S12 Park Brake Switch	W—X4 Connector to W9 eHydro™ Wiring Harness	AK—G2 Alternator Battery+
E—S3 Light Switch	O—S8 Seat Switch	X—S2 Key Switch	AL—B3 Engine Coolant Temperature Sensor
F—S21 Front PTO Switch	P—Y3 PTO Solenoid	Y—S13 Hazard Lights Switch	AM—B1 Air Restriction Switch
G—S4 Rear PTO Switch	Q—S10 MFWD Engagement Sensing Switch	Z—S14 Turn Signal Switch	AN—R1 Manifold Heater
H—RH Tail/Warning Light	R—S11 Transmission Neutral Switch (PRT) or W4 Jumper (eHydro™)	AA—Y2 Fuel Shutoff Solenoid	AO—X11 Connector to A1 Display Panel
Connectors to W8 Right Rear Lights Wiring Harness	S—X12 Connector to W9 Wiring Harness	AB—K5 Flasher Relay	AP—X10 Connector to A1 Display Panel
I— X25 License Plate Light Connector	T—S15 Brake Switch	AC—Y6 Front PTO Clutch	AQ—X6 Connector to A1 Display Panel
J—S7 Rear PTO Sensing Switch		AD—B2 Engine Oil Pressure Switch	
K—S9 Mid PTO Sensing Switch		AE—W1 Ground	
		AF—M2 Fuel Pump	
		AG—S5 Display Mode Switch	

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SW03989,0000D29 -19-05NOV10-2/2

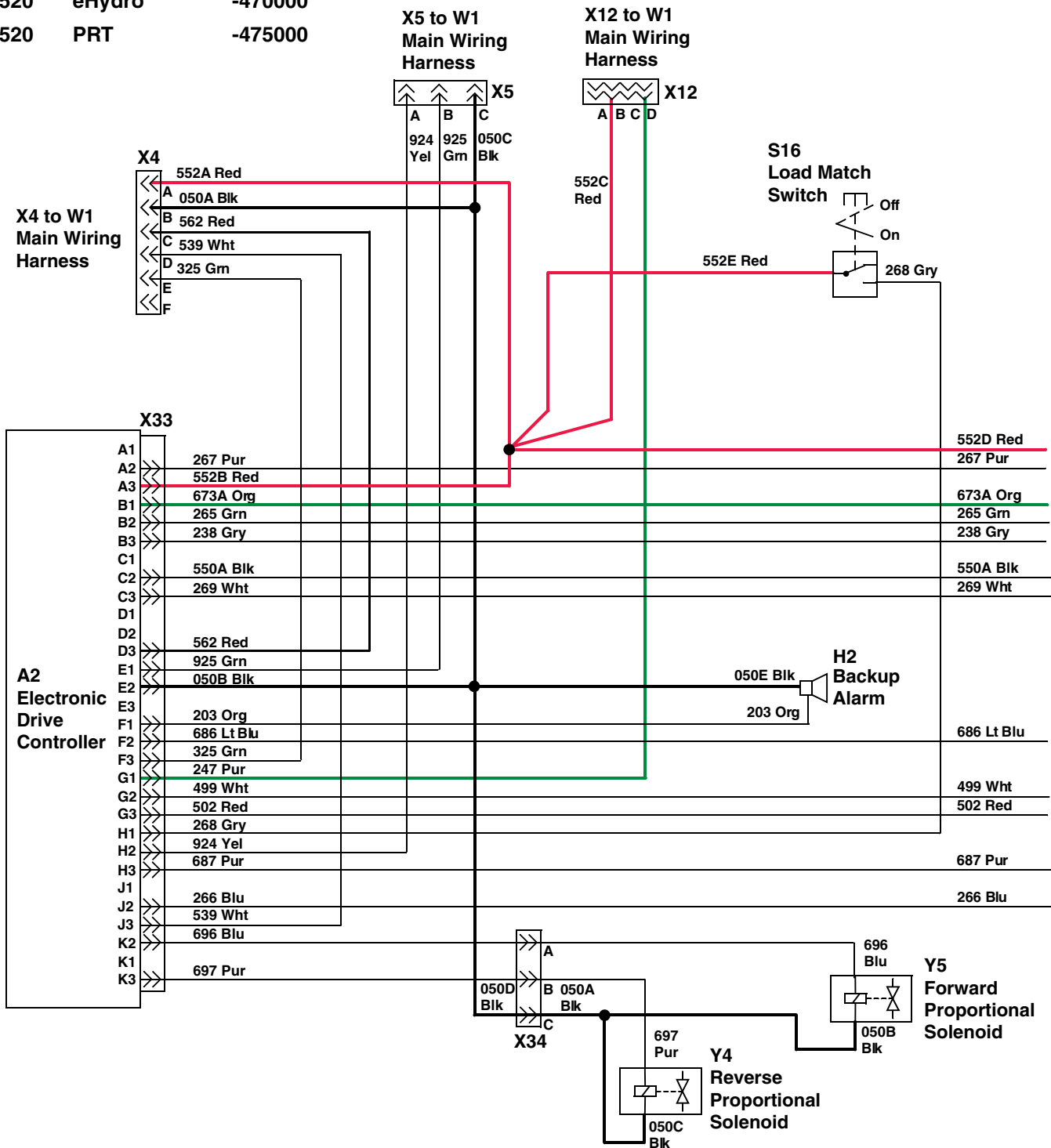
W9 eHydro™ and Cruise Control Electrical Schematic (1 of 2) (Pre MY08)

Model	Transmission	Serial Number
3320	eHydro™	-435000
3320	PRT	-440000
3520	eHydro™	-470000
3520	PRT	-475000

Continued on next page

SW03989.0000D2A -19-05NOV10-1/4

Model	Transmission	Serial Number
3320	eHydro	-435000
3320	PRT	-440000
3520	eHydro	-470000
3520	PRT	-475000



W9 eHydro™ and Cruise Control Electrical Schematic

LVAL11908 —UN—12NOV10

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SW03989,0000D2A -19-05NOV10-2/4

Schematics and Harnesses

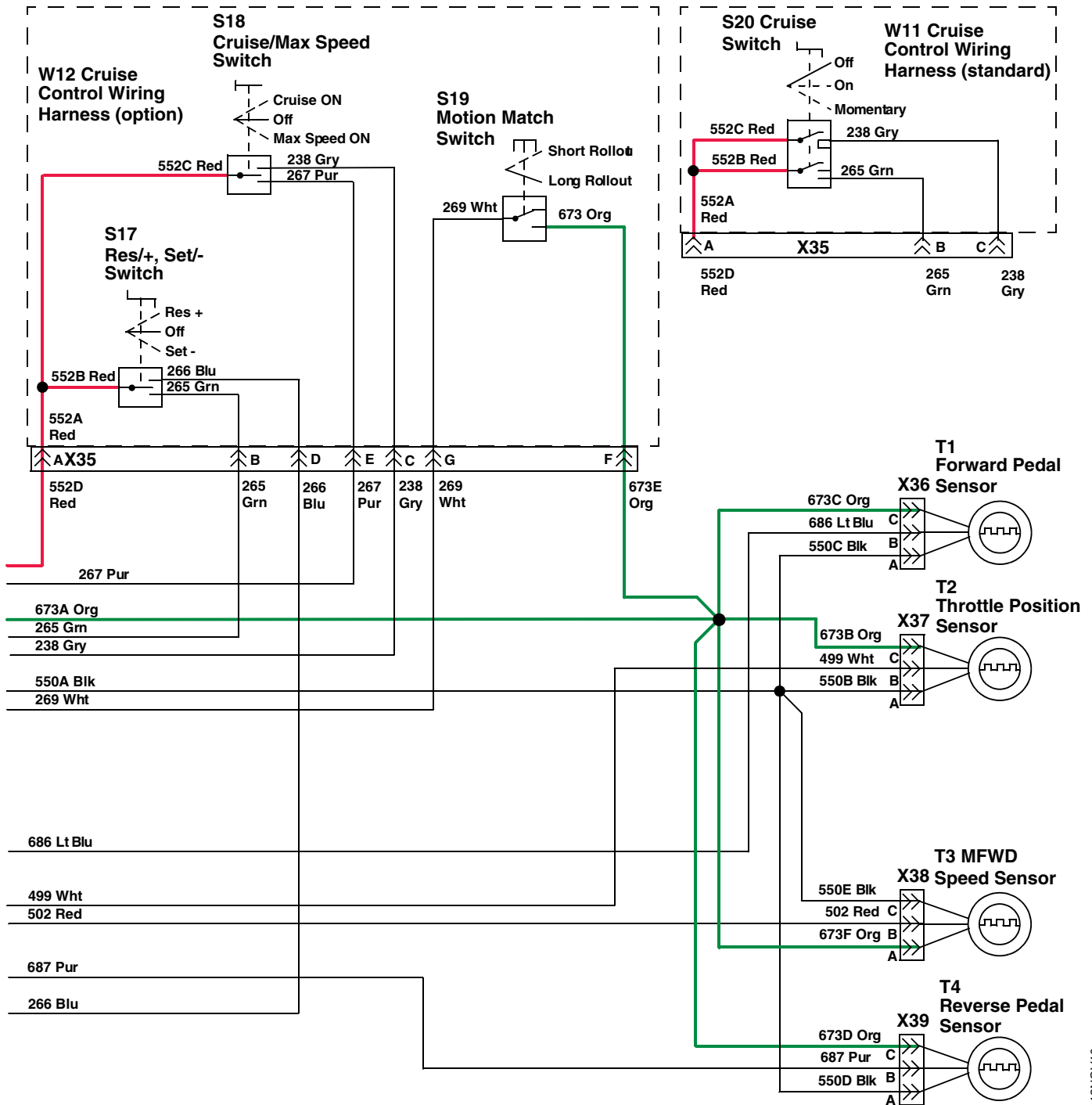
A2—Electronic Drive Controller	X5—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X34— W9 eHydro™ Wiring Harness to W10 Proportional Valve Wiring Harness
H2—Backup Alarm		
S16— Load Match Switch		
X4—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X12— W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	Y4—Reverse Proportional Solenoid
	X33— W9 eHydro™ Wiring Harness to A2 Electronic Drive Controller	Y5—Forward Proportional Solenoid

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SW03989,0000D2A -19-05NOV10-3/4

W9 and Cruise Control Electrical Schematic (2 of 2) (Pre MY08)



W9 eHydro™ and Cruise Control Electrical Schematic

LVAL11909—UN—12NOV10

SW03989,0000D2A -19-05NOV10-4/4

S18— Cruise/Max Speed Switch
S19— Motion Match Switch
S20— Cruise Switch
T1— Forward Pedal Sensor
T2— Throttle Position Sensor
T3— MFWD Speed Sensor

T4— Reverse Pedal Sensor
W11—Cruise Control Wiring Harness (standard)
W12—Cruise Control Wiring Harness (option)
X35— W9 eHydro™ Wiring Harness to W11 Cruise Control Wiring Harness (standard)

X36— W9 eHydro™ Wiring Harness to T1 Forward Pedal Sensor
X37— W9 eHydro™ Wiring Harness to T2 Throttle Position Sensor
X38— W9 eHydro™ Wiring Harness to T3 MFWD Speed Sensor

X39— W9 eHydro™ Wiring Harness to T4 Reverse Pedal Sensor

SW03989,0000D2A -19-05NOV10-5/4

W9 eHydro™ Wiring Harness Color Codes

Size/No./Color	Wire Connection Points
0.8 050A Blk	Splice 050, X4
0.5 050B Blk	Splice 050, X33
0.5 050C Blk	Splice 050, X5
0.5 050D Blk	Splice 050, X34
0.5 050E Blk	Splice 050, H2
0.8 203 Org	X33, H2
0.5 238 Gry	X33, X35
0.5 247 Pur	X33, X12
0.5 265 Grn	X33, X35
0.5 266 Blu	X33, X35
0.5 267 Pur	X33, X35
0.5 268 Gry	X33, S16
0.5 269 Wht	X33, X35
0.5 325 Grn	X33, X4
0.5 499 Wht	X33, T2
0.8 502 Red	X33, T3
0.5 539 Wht	X4, X33
0.8 550A Blk	Splice 550, X33
0.5 550B Blk	Splice 550, T2
0.5 550C Blk	Splice 550, T1
0.5 550D Blk	Splice 550, T4
0.5 550E Blk	Splice 550, T3
0.8 552A Red	Splice 552, X4
0.5 552B Red	Splice 552, X33
0.5 552C Red	Splice, X12
0.5 552D Red	Splice 552, X35
0.5 552E Red	Splice 552, S16
0.5 562 Red	X4, X33
0.8 673A Org	Splice 673, X33
0.5 673B Org	Splice 673, T2
0.5 673C Org	Splice 673, T1
0.5 673D Org	Splice 673, T4
0.5 673E Org	Splice 673, X35
0.5 673F Org	Splice 673, T3
0.5 686 Lt Blu	X33, T1
0.5 687 Pur	X33, T4
0.5 696 Blu	X33, X34
0.5 697 Pur	X33, X34
0.5 924 Yel	X33, X5
0.5 925 Grn	X33, X5

Wiring Harness Color Codes

SW03989,0000D2B -19-05NOV10-1/1

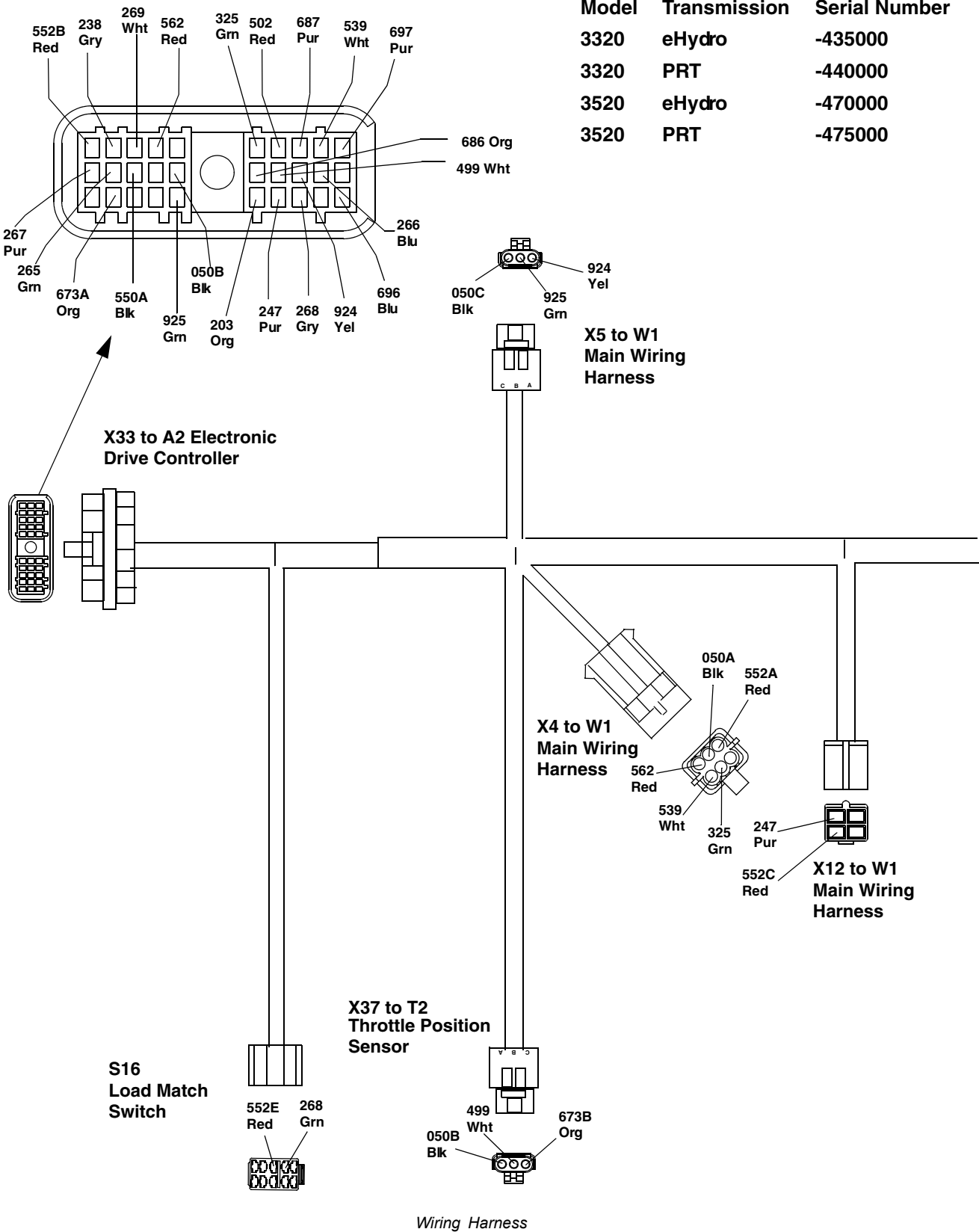
W9 eHydro™ Wiring Harness (Pre MY08)

Model	Transmission	Serial Number
3320	eHydro™	-435000
3320	PRT	-440000
3520	eHydro™	-470000
3520	PRT	-475000

Serial Number Breaks—Pre MY08

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SW03989,0000D2C -19-05NOV10-1/4



LVAL11910—UN—12NOV10

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SW03989,0000D2C -19-05NOV10-2/4

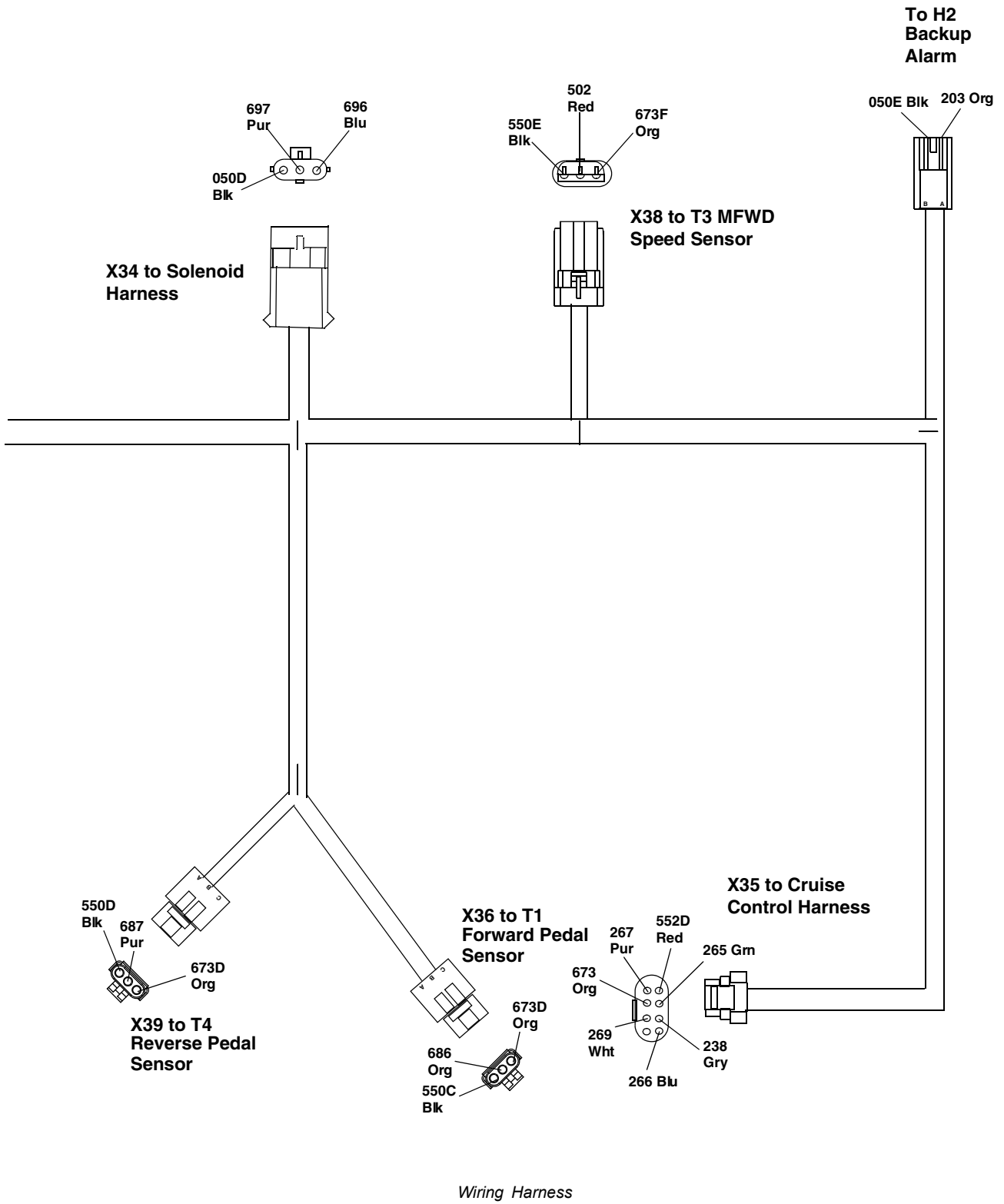
Schematics and Harnesses

A2—Electronic Drive Controller	X5—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X33— W9 eHydro™ Wiring Harness to A2 Electronic Drive Controller
S16— Load Match Switch		
T2— Throttle Position Sensor	X12— W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X37— W9 eHydro™ Wiring Harness to T2 Throttle Position Sensor
W1—Main Wiring Harness		
X4—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness		

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SW03989,0000D2C -19-05NOV10-3/4



LVAL11911—UN—12NOV10

SW03989,0000D2C -19-05NOV10-4/4

Schematics and Harnesses

T1— Forward Pedal Sensor
T3— MFWD Speed Sensor
T4— Reverse Proportional
Solenoid

X34— To Solenoid Harness
X35— To Cruise Control Harness
X36— W9 eHydro™ Wiring
Harness to T1 Forward
Pedal Sensor

X38— W9 eHydro™ Wiring
Harness to T3 MFWD
Speed Sensor
X39— W9 eHydro™ Wiring
Harness to T4 Reverse
Pedal Sensor

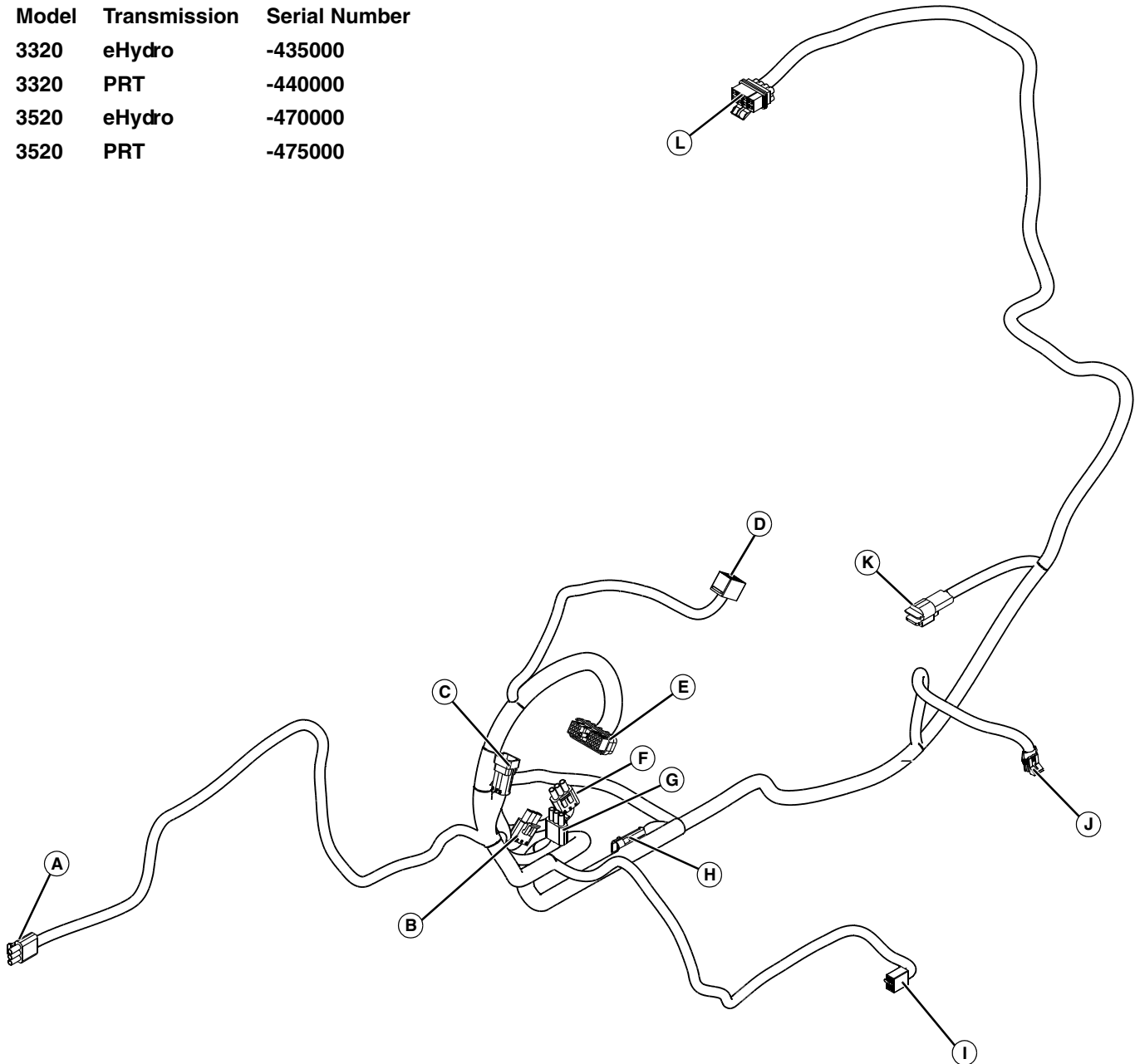
SW03989,0000D2C -19-05NOV10-5/4

W9 eHydro™ Wiring Harness Component Location (Pre MY08)

Model	Transmission	Serial Number
3320	eHydro™	-435000
3320	PRT	-440000
3520	eHydro™	-470000
3520	PRT	-475000

Serial Number Breaks—Pre MY08

Model	Transmission	Serial Number
3320	eHydro	-435000
3320	PRT	-440000
3520	eHydro	-470000
3520	PRT	-475000



Wiring Harness Component Location

LVAL11912—UN—12NOV10

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SW03989.0000D2D -19-05NOV10-1/2

Schematics and Harnesses

A—T2 Throttle Sensor	E—A2 Electronic Drive Controller	I— X12 Connector to W1 Main
B—T1 Forward Pedal Sensor	F— T4 Reverse Pedal Sensor	Wiring Harness
C—X4 Connector to W1 Main	G—X5 Connector to W1 Main	J— T3 MFWD Speed Sensor
Wiring Harness	Wiring Harness	K—H2 Back Up Alarm
D—S16 Load Match Switch	H—X34 Connector to W10 Valve	L—X35 Connector to W11 or
	Wiring Harness	W12 Cruise Control Wiring
		Harness

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SW03989,0000D2D -19-05NOV10-2/2

Main Schematic and Wiring Harness Legend—PRT and eHydro™—MY08

Model Year 2008 Serial Number Breaks

Model	Transmission	Serial Number
3320	eHydro™	435001-
3320	PRT	440001-
3520	eHydro™	470001-
3520	PRT	475001-
3720	eHydro™	492001-

Component Legend:

A1—Display Panel	F10—Fuse 15A
B1—Air Filter Restriction Switch	F11—Fuse 10A
B2—Engine Oil Pressure Switch	F12—Fuse 15A
B3—Engine Coolant Temperature Sensor	G1—Battery
B4—Fuel Gauge Sensor	G2—Alternator
E1—Left Headlight	H1—Horn
E2—Right Headlight	K1—Fuel Relay
E3—Left Work Light	K2—Start Relay
E4—Right Work Light	K3—Manifold Heater Relay
E5—Right Front Turn/Hazard Light	K4—Lights Relay
E6—Right Front Marker Light	K5—Trailer Relay
E7—Right Rear Turn/Hazard Light	K6—Brake Relay
E8—Right Rear Marker Light	K7—Flasher Relay
E9—Right Brake Light	M1—Starting Motor
E10—License Plate Light	M2—Fuel Pump
E11—Left Front Turn/Hazard Light	R1—Manifold Heater
E12—Left Front Marker Light	S1—Horn Switch
E13—Left Rear Turn/Hazard Light	S2—Key Switch
E14—Left Rear Marker Light	S3—Light Switch
E15—Left Brake Light	S4—Rear PTO Switch
F1—Fusible Link	S5—Display Mode Switch
F2—Fusible Link	S7—Rear PTO Engagement Sensing Switch
F3—Fuse 30A	S8—Seat Switch
F4—Fuse 20A	S9—Mid PTO Switch (option)
F5—Fuse 30A	S10—MFWD Engagement Sensing Switch
F6—Fuse 20A	S11—Transmission Neutral Switch (PRT)
F7—Fuse 20A	S12—Park Brake Switch
F8—Fuse 20A	S13—Hazard Lights Switch
F9—Fuse 15A	S14—Turn Signal Switch
	S15—Brake Switch
	S21—Front PTO Switch
	W1—Battery/Frame Ground
	Y1—Starting Motor Solenoid
	Y2—Fuel Shutoff Solenoid
	Y3—Rear PTO Solenoid
	Y6—Front PTO Clutch

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SW03989.0000D2E -19-05NOV10-1/2

Connectors:

X1—W1 Main Wiring Harness to Y2 Fuel Shutoff Solenoid
 X2—W1 Main Wiring Harness to R1 Manifold Heater
 X3—W1 Main Wiring Harness to W2 Headlight/Horn Wiring Harness
 X4—W1 Main Wiring Harness to W9 Wiring Harness
 X5—W1 Main Wiring Harness to W9 Wiring Harness
 X6—W1 Main Wiring Harness to A1 Display Panel
 X7—W1 Main Wiring Harness to A1 Display Panel
 X8—W1 Main Wiring Harness to W3 Jumper Plug (standard), S9 Mid PTO Switch (optional)
 X9—W1 Main Wiring Harness to S11 Transmission Neutral Switch (PRT), W4 Jumper Plug eHydro™
 X10—W1 Main Wiring Harness to A1 Display Panel
 X11—W1 Main Wiring Harness to A1 Display Panel
 X13—W1 Main Wiring Harness Trailer Connector
 X14—W1 Main Wiring Harness to W5 Left Work Light Wiring Harness (optional)
 X15—W1 Main Wiring Harness to W5 Left Work Light Wiring Harness (optional)
 X16—W1 Main Wiring Harness to W6 Right Work Light Wiring Harness (optional)
 X17—W1 Main Wiring Harness to W6 Right Work Light Wiring Harness (optional)
 X18—W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness
 X19—W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness
 X20—W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness
 X21—W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness

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X22—W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness
 X23—W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness
 X24—W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness
 X25—W1 Main Wiring Harness to E10 License Plate Light
 X26—W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
 X27—W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
 X28—W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
 X29—W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
 X30—W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
 X31—W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
 X32—W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
 X40—W1 Main Wiring Harness to W13 Cab Wiring Harness

Wiring Harnesses:

W1—Main Wiring Harness
 W2—Headlight/Horn Wiring Harness
 W3—Jumper Plug
 W4—Jumper Plug
 W5—Right Work Light Wiring Harness (optional)
 W6—Left Work Light Wiring Harness (optional)
 W7—Left Rear Lights Wiring Harness
 W8—Right Rear Lights Wiring Harness

SW03989,0000D2E -19-05NOV10-2/2

eHydro™—Schematic and Wiring Harness Legend—MY08

A2—Electronic Drive Controller

H2—Backup Alarm

S16—Load Match Switch

S17—Res/+, Set/- Switch (optional)

S18—Cruise Control/Max Speed Switch (optional)

S19—Motion Match Switch (optional)

S20—Cruise Control Switch (standard)

T1—Forward Pedal Sensor

T2—Throttle Position Sensor

T3—MFWD Speed Sensor

T4—Reverse Pedal Sensor

Y4—Reverse Proportional Solenoid

Y5—Forward Proportional Solenoid

Connectors:

X33—W9 Wiring Harness to A2 Electronic Drive Controller

X34—W9 Wiring Harness to W10 Proportional Valve Wiring Harness

X35—W9 Wiring Harness to W11 Cruise Control Wiring Harness (standard)

X35—W9 Wiring Harness to W12 Cruise Control Wiring Harness (optional)

X36—W9 Wiring Harness to T1 Forward Pedal Sensor

X37—W9 Wiring Harness to T2 Throttle Position Sensor

X38—W9 Wiring Harness to T3 MFWD Speed Sensor

X39—W9 Wiring Harness to T4 Reverse Pedal Sensor

Wiring Harnesses:

W9—Wiring Harness

W10—Proportional Valve Wiring Harness

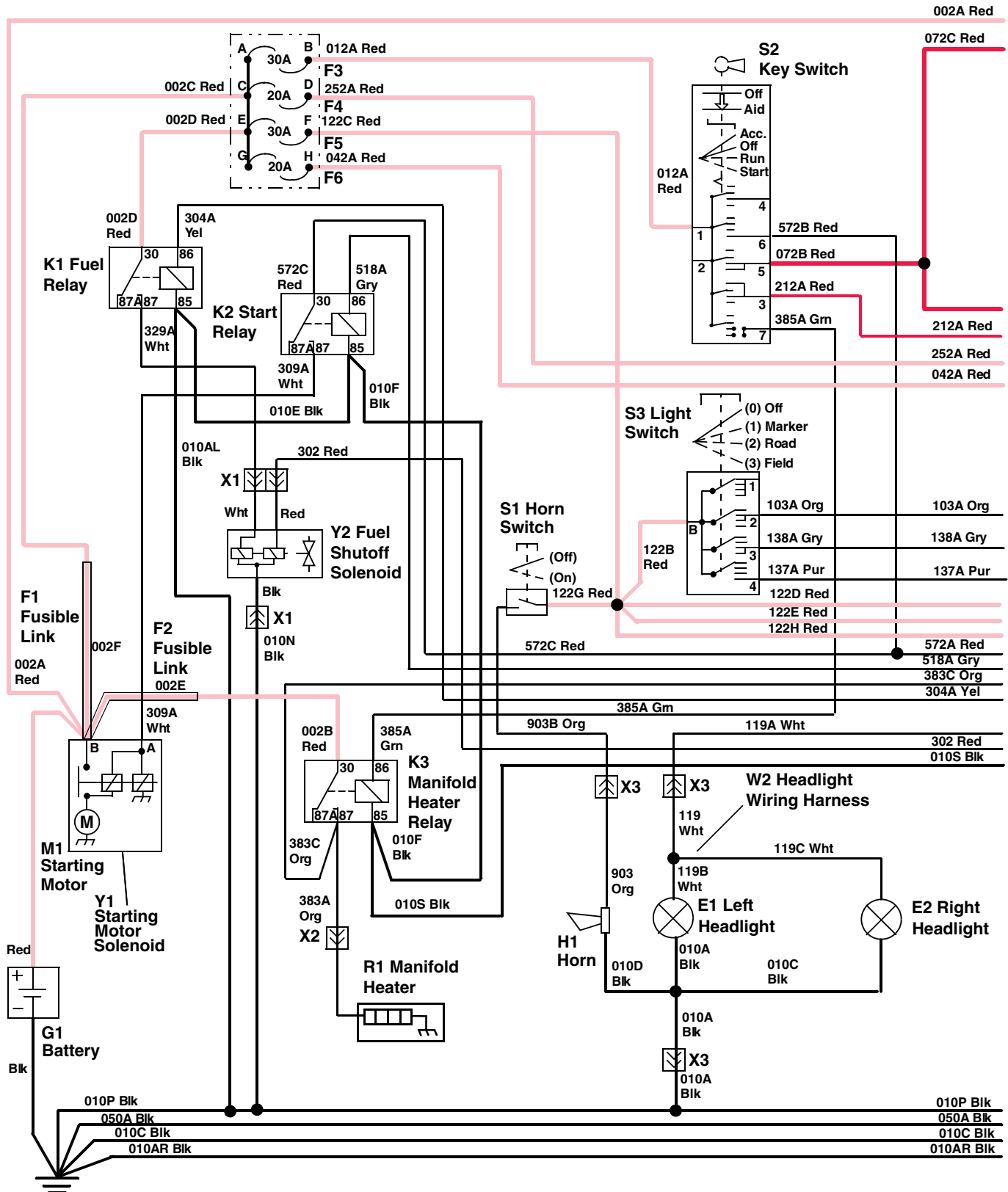
W11—Cruise Control Wiring Harness (standard)

W12—Cruise Control Wiring Harness (optional)

W13—Cab Wiring Harness (optional)

SW03989,0000D2F -19-05NOV10-1/1

Main Electrical Schematic—MY08



Main Electrical Schematic

Continued on next page

SW03989,0000D30 -19-05NOV10-1/12

LVAL11913—UN—12NOV10

E1 — Left Headlight
E2—Right Headlight
F1— Fusible Link
F2— Fusible Link
F3— Fuse 30A
F4— Fuse 30A
F5— Fuse 30A
F6— Fuse 20A
G1—Battery

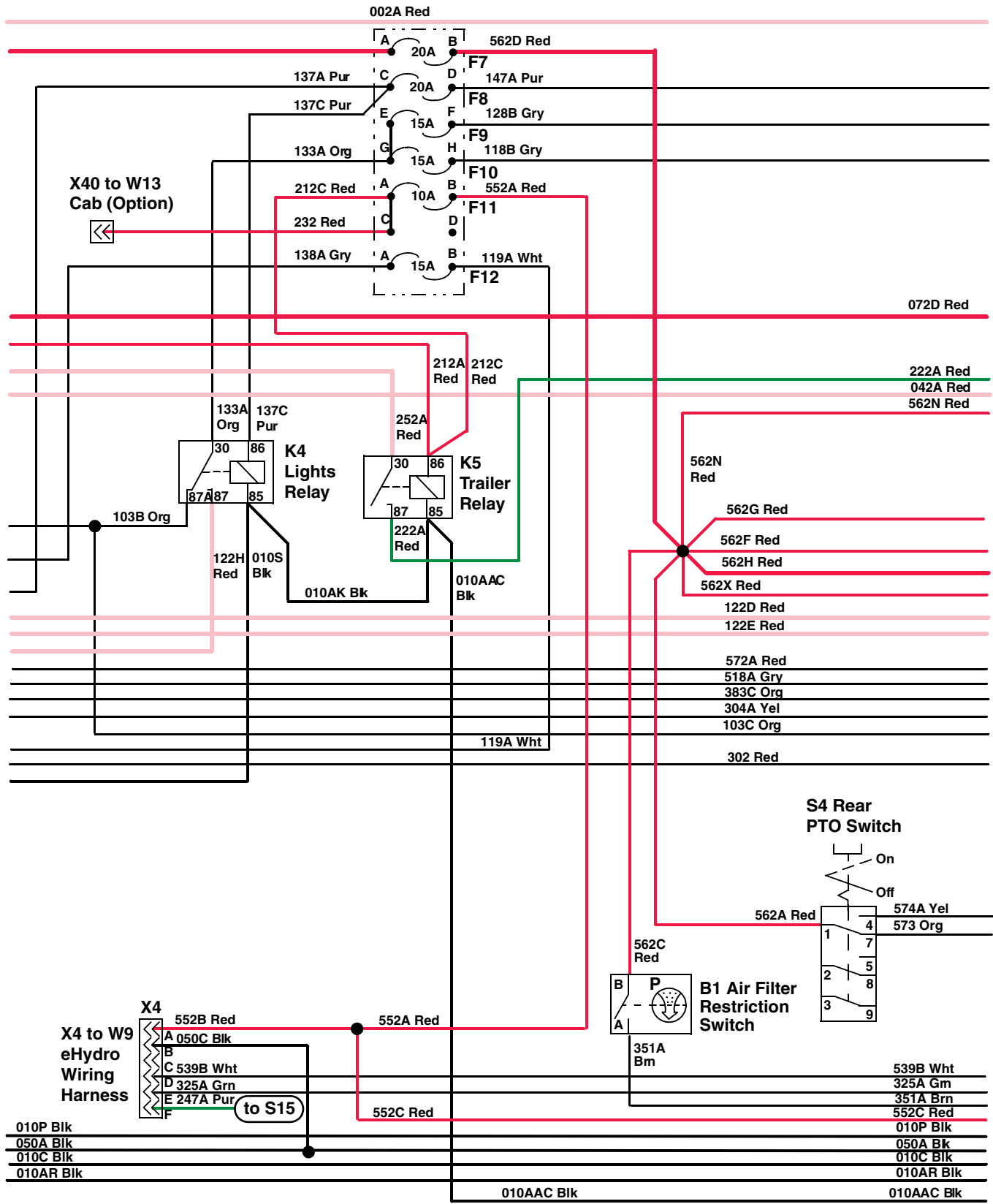
K1—Fuel relay
K2 — Start Relay
K3—Manifold Heater Relay
M1—Starting Motor
R1—Manifold Heater
S1—Horn Switch
S3— Light Switch

W2—Headlight Wiring Harness
X1— W1 Main Wiring Harness to
Y2 Fuel Shutoff Solenoid
X2— W1 Main Wiring Harness to
R1 Manifold Heater

X3— W1 Main Wiring Harness to
W2 Headlight/Horn Wiring
Harness
Y1— Starting Motor Solenoid
Y2— Fuel Shutoff Solenoid

Continued on next page

SW03989,0000D30 -19-05NOV10-2/12



Main Electrical Schematic

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SW03989,0000D30 -19-05NOV10-3/12

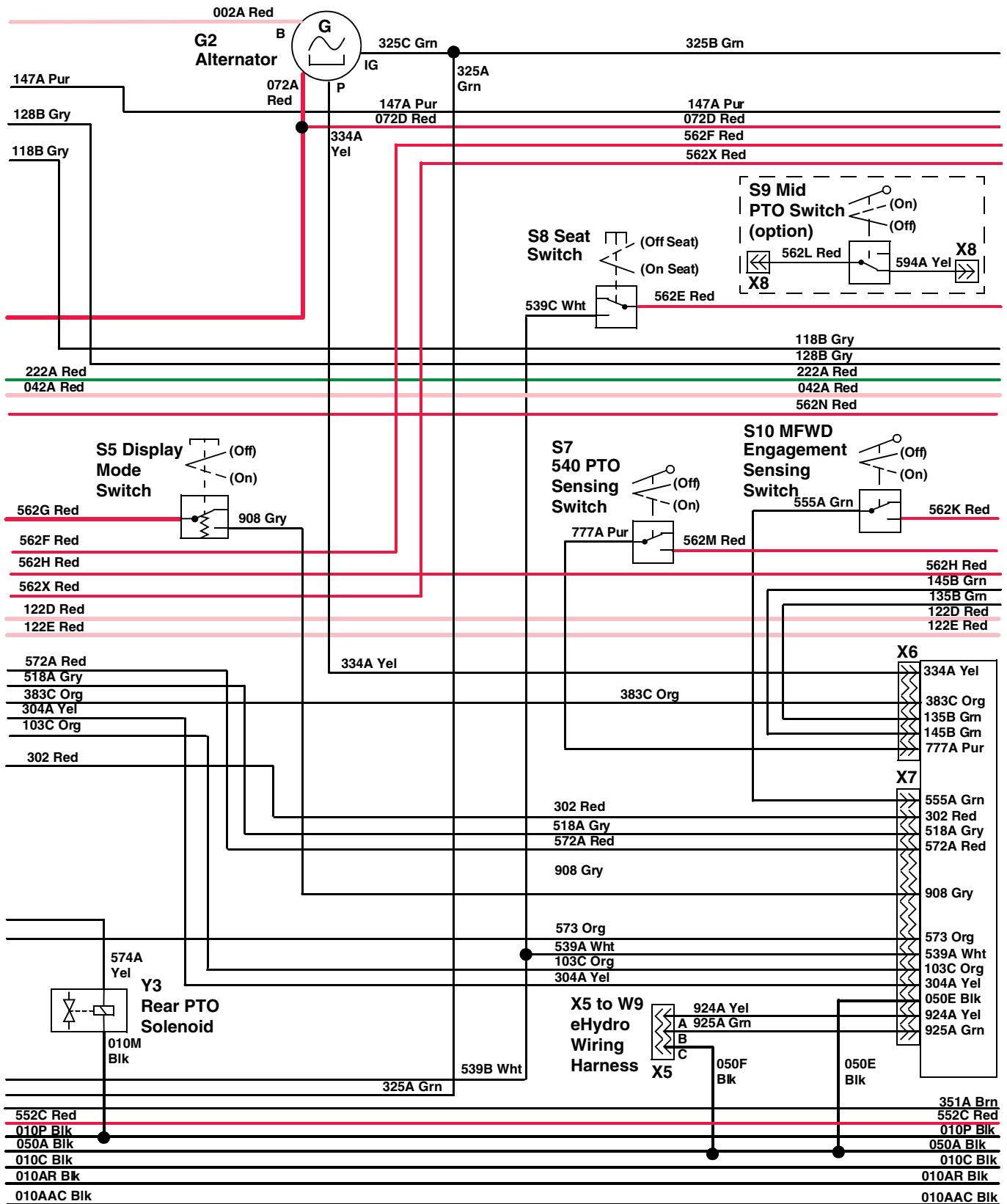
LVAL11914 —UN—12NOV10

B1—Air Filter Restriction Switch	K4—Trailer Relay	W13—Cab Wiring Harness	X40— W1 Main Wiring Harness to
F7— Fuse 20A	K5—Flasher Relay	(optional)	W13 Cab Wiring Harness
F8— Fuse 20A	S4—Rear PTO Switch	X4— W1 Main Wiring Harness to	
F9— Fuse 20A	S19— Motion Match Switch	W9eHydro™ Wiring Harness	
F10— Fuse 20A	(optional)		
F11— Fuse 10A	W9—eHydro Wiring Harness		
F12— Fuse 20A			

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SW03989,0000D30 -19-05NOV10-4/12



LVAL11915—UN—12NOV10

Main Electrical Schematic

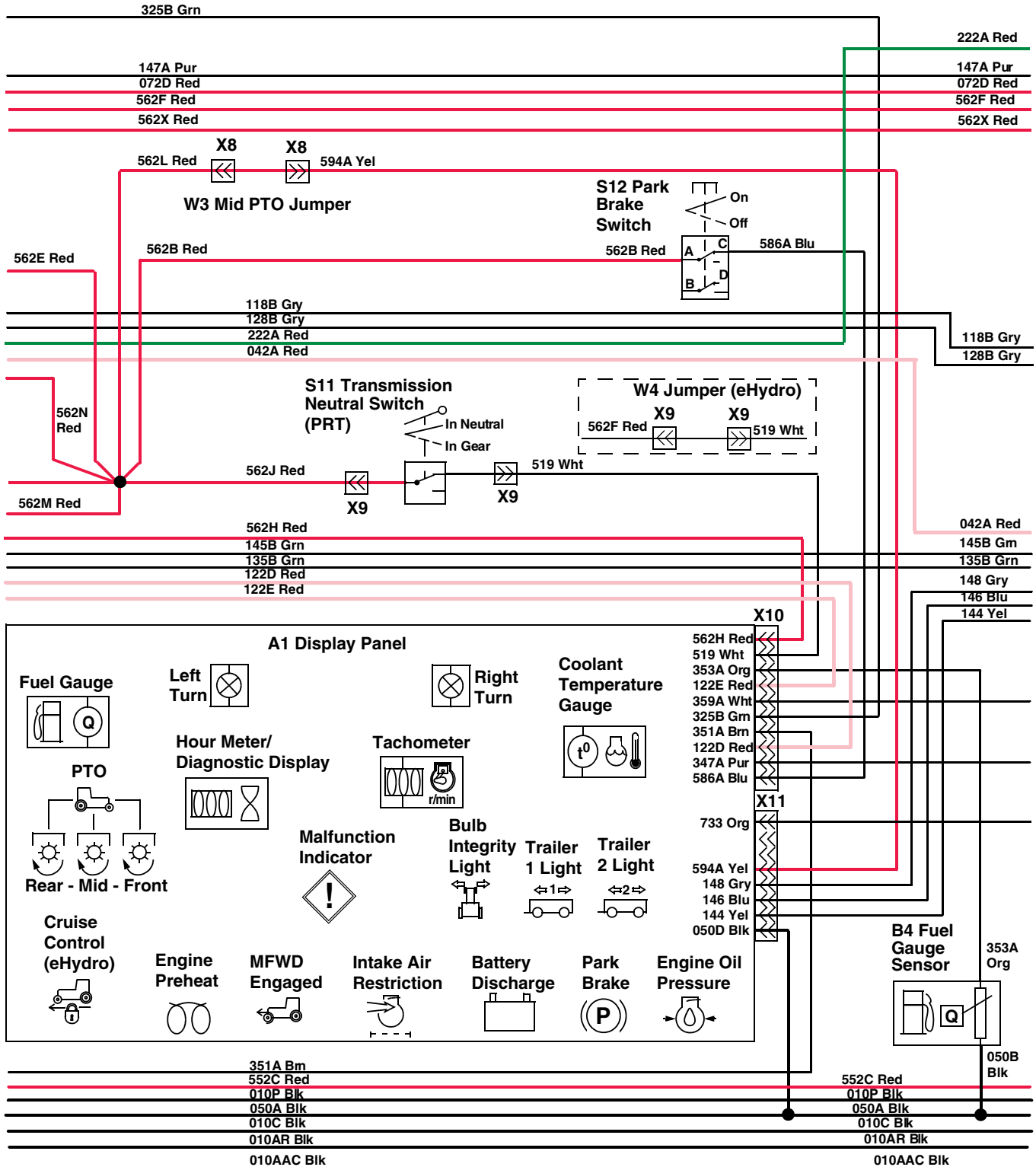
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SW03989,0000D30 -19-05NOV10-5/12

G2—Alternator	S10— MFWD Engagement Sensing Switch	X6— W1 Main Wiring Harness to A1 Display Panel	Y3— Rear PTO Solenoid
S5— Display Mode Switch	W9—eHydro Wiring Harness	X7— W1 Main Wiring Harness to A1 Display Panel	
S7— 540 PTO Sensing Switch	X5— W1 Main Wiring Harness to W9 eHydro Wiring Harness	X8— W1 Main Wiring Harness to W3 Jumper Plug (standard), S9 Mid PTO Switch (optional)	
S8— Seat Switch			
S9— Mild PTO Switch (option)			

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SW03989,0000D30 -19-05NOV10-6/12



Main Electrical Schematic

Continued on next page

SW03989,0000D30 -19-05NOV10-7/12

LVAL11916—UN—12NOV10

A1—Display Panel
B4—Fuel Gauge Sensor
S11— Transmission Neutral
Switch
S12— Park Brake Switch
W3—Mild PTO Jumper

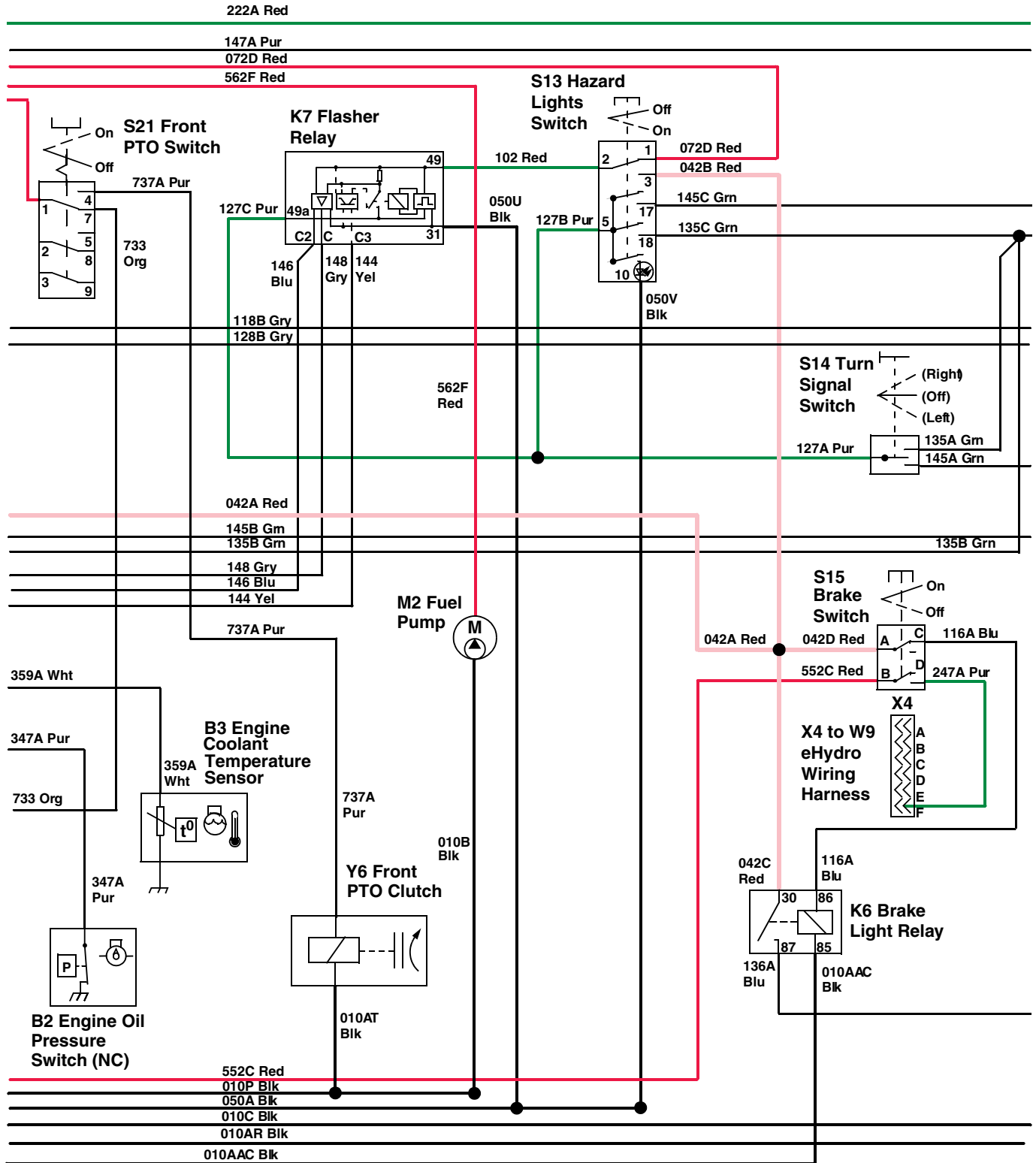
W4—Jumper (eHydro™)
X8— W1 Main Wiring Harness to
W3 Jumper Plug (standard),
S9 Mid PTO Switch (optional)

X9— W1 Main Wiring Harness to
S11 Transmission Neutral
Switch (PRT), W4 Jumper
Plug (eHydro)
X10— W1 Main Wiring Harness
to A1 Display Panel

X11— W1 Main Wiring Harness
to A1 Display Panel

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SW03989,0000D30 -19-05NOV10-8/12



Main Electrical Schematic

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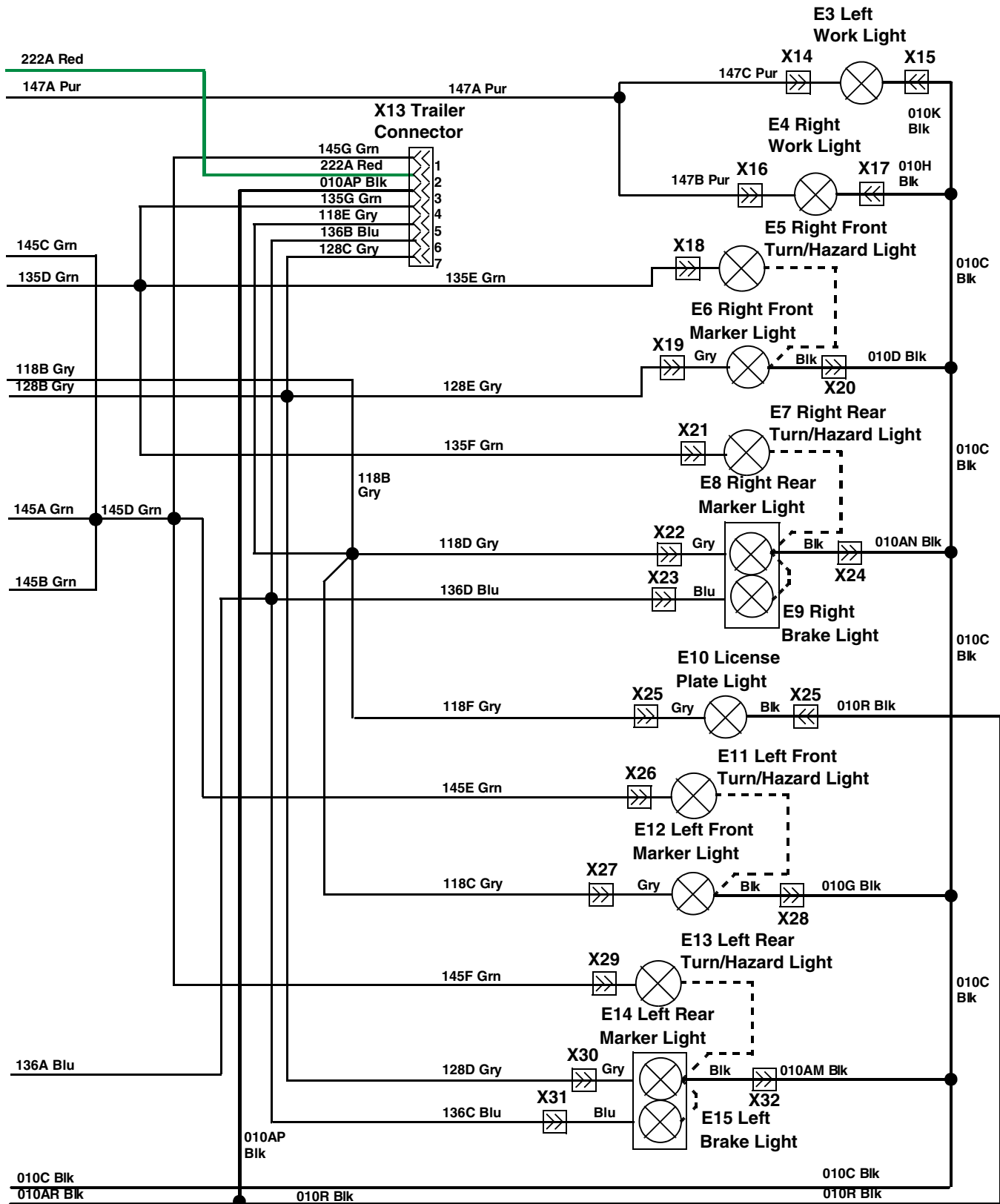
SW03989,0000D30 -19-05NOV10-9/12

LVAL11917 -UN-12NOV10

B2—Engine Oil Pressure Switch (NC)	K7—Flasher Relay	S15— Brake Switch	Y6— Front PTO Clutch
B3—Engine Coolant Temperature Sensor	M2—Fuel Pump	S21— Front PTO Switch	
K6—Brake Light Relay	S13— Hazard Lights Switch	W9—eHydro Wiring Harness	
	S14— Turn Signal Switch	X4— W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	

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SW03989,0000D30 -19-05NOV10-10/12



Main Electrical Schematic

LVAL11918—UN—12NOV10

Continued on next page

SW03989,0000D30 -19-05NOV10-11/12

E3— Left Work Light	X15— W1 Main Wiring Harness to W5 Left Work Light Wiring Harness (optional)	X21— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X28— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E4— Right Work Light	X16— W1 Main Wiring Harness to W6 Right Work Light Wiring Harness (optional)	X22— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X29— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E5— Right Front Turn/Hazard Light	X17— W1 Main Wiring Harness to W6 Right Work Light Wiring Harness (optional)	X23— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X30— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E6— Right Front Marker Light	X18— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X24— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X31— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E7— Right Rear Turn/Hazard Light	X19— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X25— W1 Main Wiring Harness to E10 License Plate Light	X32— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E8— Right Rear marker Light	X20— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X26— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
E9— Right Brake light		X27— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
E10— License Plate Light			
E11— Left Front Turn/Hazard Light			
E12— Left Front Marker Light			
E13— Left Rear Turn/Hazard Light			
E14— Left Rear marker Light			
E15— Left brake Light			
X13— Trailer Connector			
X14— W1 Main Wiring Harness to W5 Left Work Light Wiring Harness (optional)			

SW03989,0000D30 -19-05NOV10-12/12

W1 Main Wiring Harness—MY08

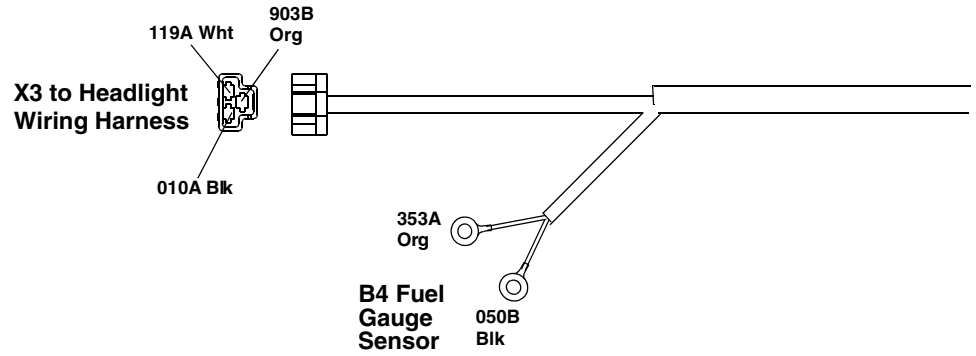
Model	Transmission	Serial Number
3320	eHydro™	435001-
3320	PRT	440001-
3520	eHydro™	470001-
3520	PRT	475001-
3720	eHydro™	492001-

Model Year 2008 Serial Number Breaks

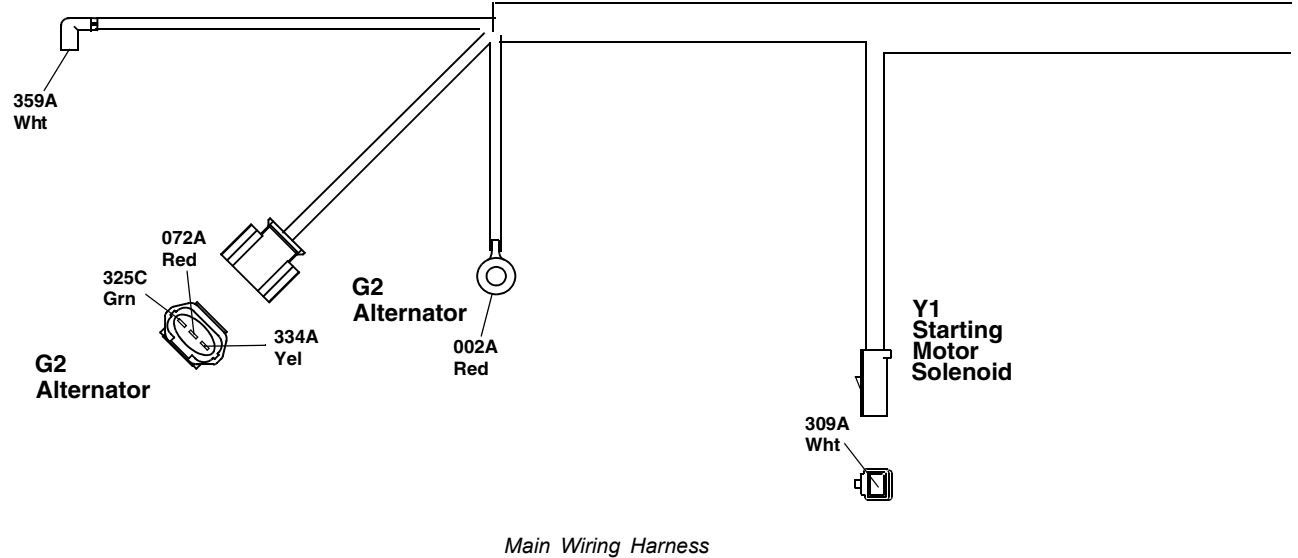
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SW03989,0000D31 -19-05NOV10-1/7

Model	Transmission	Serial Number
3320	eHydro	435001-
3320	PRT	440001-
3520	eHydro	470001-
3520	PRT	475001-
3720	eHydro	492001-



B3 Engine Coolant Temperature Sensor



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SW03989,0000D31 -19-05NOV10-2/7

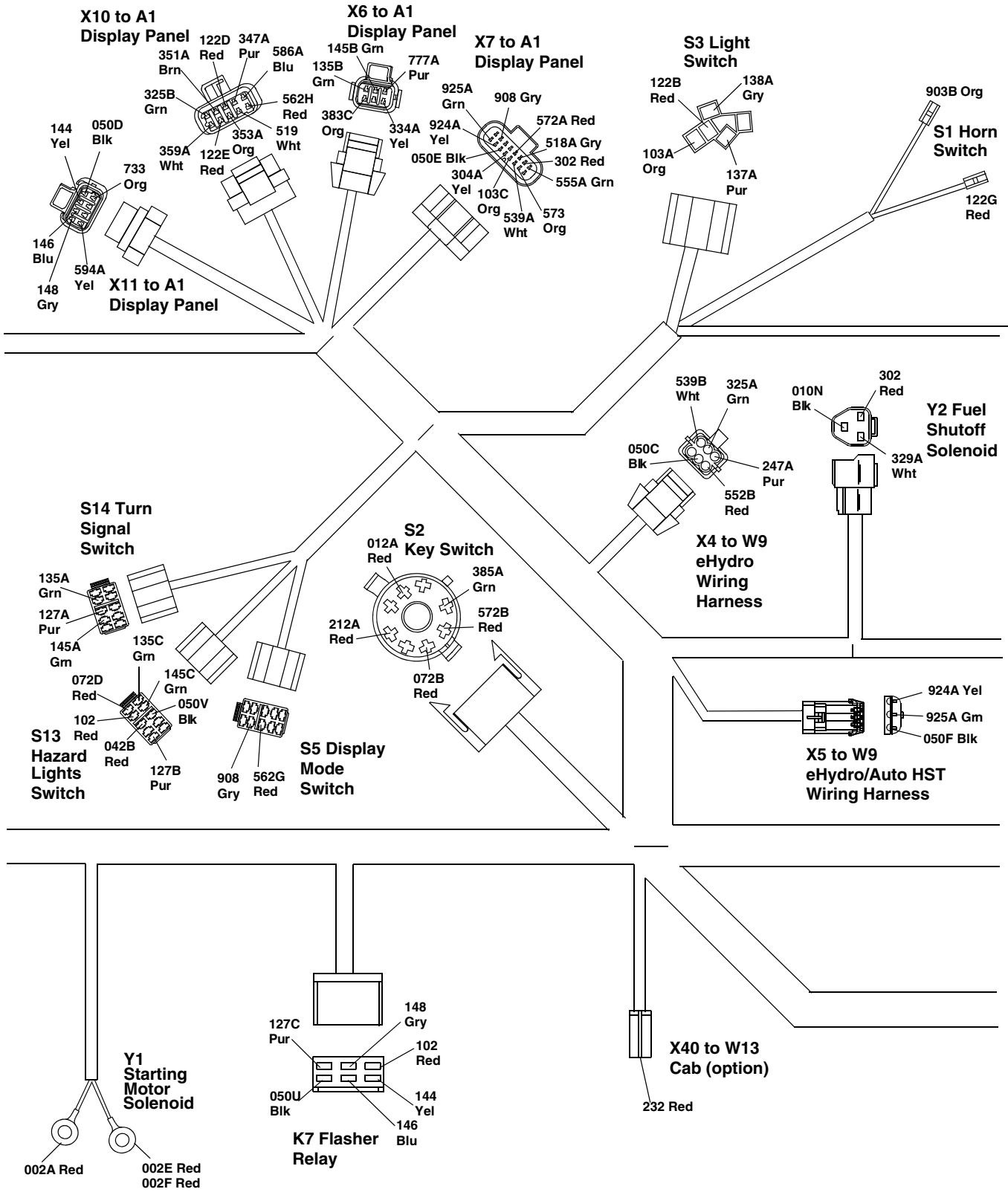
LVAL11919 —UN—12NOV10

B3—Engine Coolant Temperature Sensor
B4—Fuel gauge Sensor
G2—Alternator
X3—W1 Main Wiring Harness to W2 Headlight/Horn Wiring Harness
Y1— Starting Motor Solenoid

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SW03989,0000D31 -19-05NOV10-3/7



Main Wiring Harness

Continued on next page

SW03989,0000D31 -19-05NOV10-4/7

LVAL11920 —UN—12NOV10

A1—Display Panel
K7—Flasher Relay
S1—Horn Switch
S2—Key Switch
S3—Light Switch
S5—Display Mode Switch
S13—Hazard Lights Switch
S14—Turn Signal Switch
W9—eHydro Wiring Harness

W13—Cab Wiring Harness
(optional)
X4—W1 Main Wiring Harness
to W9 eHydro™ Wiring
Harness
X5—W1 Main Wiring Harness
to W9 eHydro™ Wiring
Harness

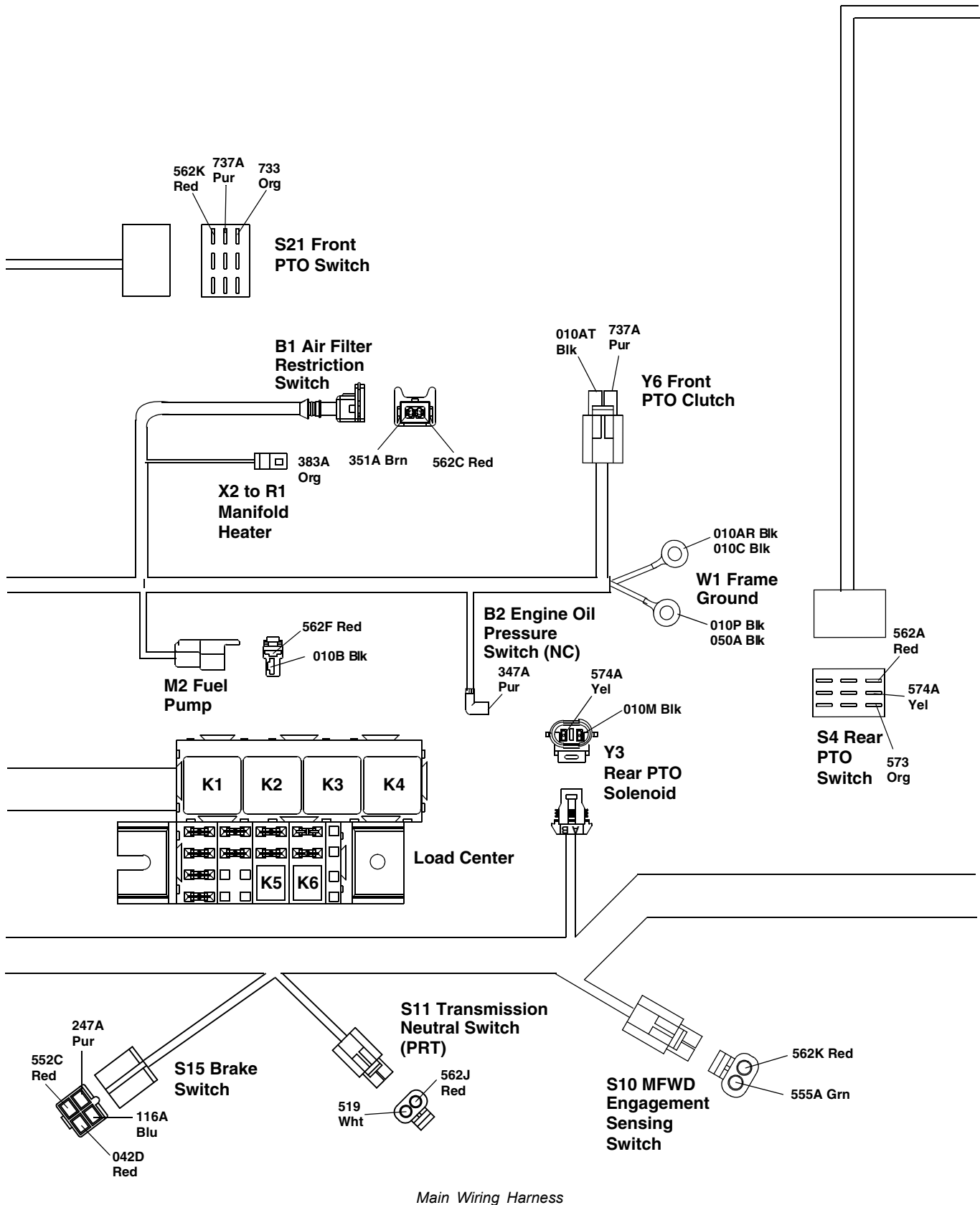
X6—W1 Main Wiring Harness to
A1 Display Panel
X7—W1 Main Wiring Harness to
A1 Display Panel
X10—W1 Main Wiring Harness
to A1 Display Panel
X11—W1 Main Wiring Harness
to A1 Display Panel

X40—W1 Main Wiring Harness to
W13 Cab Wiring Harness
Y1—Starting Motor Solenoid
Y2—Fuel Shutoff Solenoid

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SW03989,0000D31 -19-05NOV10-5/7



LVAL11921—UN—12NOV10

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SW03989,0000D31 -19-05NOV10-6/7

Schematics and Harnesses MY08

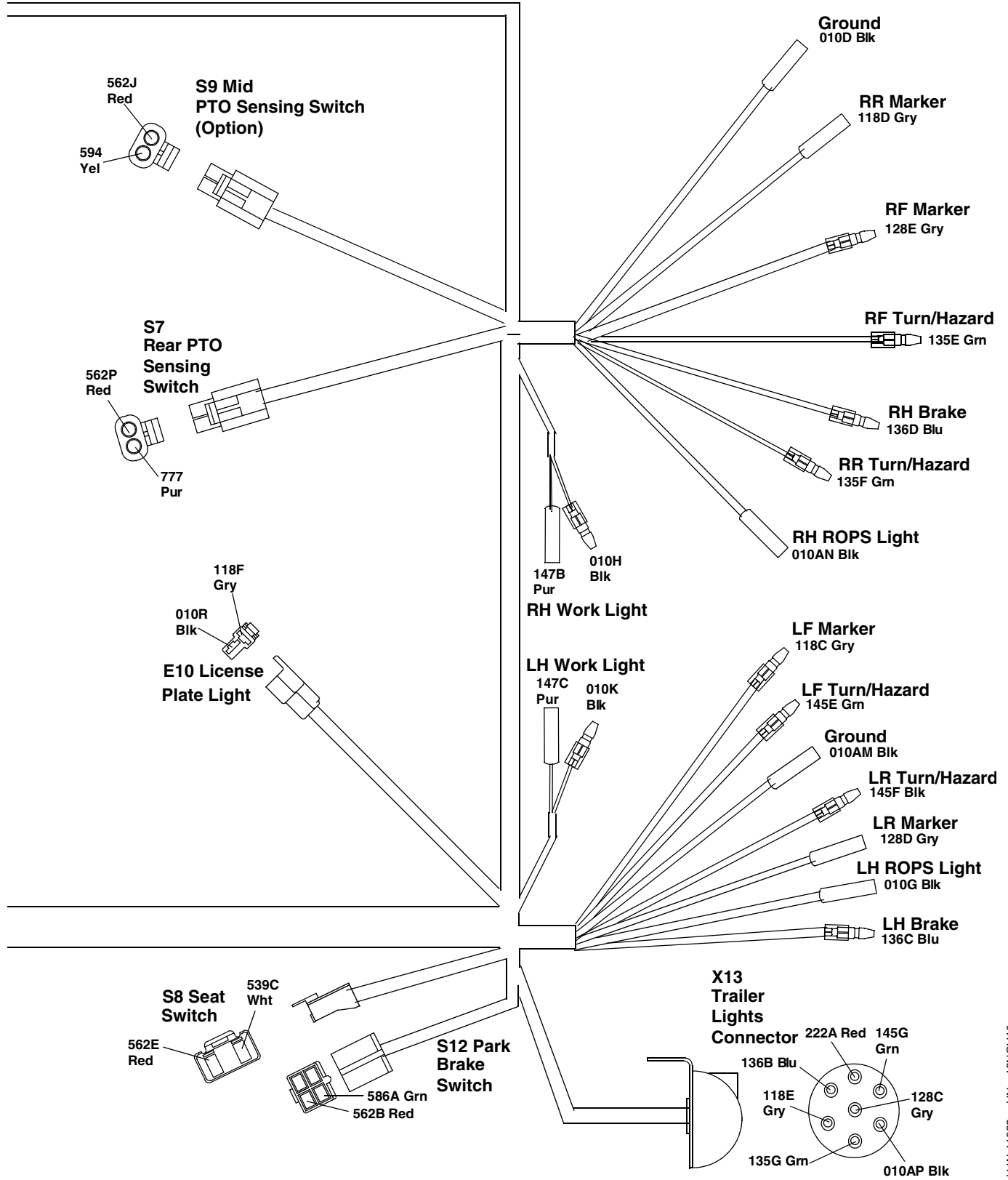
B1—Air Filter Restriction Switch
B2—Engine Oil Pressure Switch
M2—Fuel Pump
R1—Manifold Heater

S4—Rear PTO Switch
S10—MFWD Engagement
Sensing Switch
S11—Transmission Neutral
Switch (PRT)

S15—Brake Switch
S21—Front PTO Switch
W1—Frame Ground
X2—W1 Main Wiring Harness to
R1 Manifold Heater

Y3—Rear PTO Solenoid
Y6—Front PTO Clutch

SW03989,0000D31 -19-05NOV10-7/7



Main Wiring Harness

E10— License Plate Light
 S7—Rear PTO Sensing Switch
 S8—Seat Switch
 S9—Mild PTO Sensing Switch (option)
 S12— Park Brake Switch
 X13— Trailer Lights Connector

SW03989,0000D31 -19-05NOV10-8/7

LVAL11922 —UN—12NOV10

W1 Main Wiring Harness Color Codes—MY08

Size/No./Color	Wire Connection Points
5.0 002A Red	Y1, G2
5.0 002B Red	F2 Fusible Link, K3
5.0 002C Red	F1 Fusible Link, Fuse Block (F4)
5.0 002D Red	Fuse Block (F6), K1
2.0 002E	F2 Fusible Link
2.0 002F	F1 Fusible Link
1.0 010A Blk	K1, K6
0.8 010AAC Blk	K5, K6
0.8 010AK Blk	K4, K5
0.8 010AL Blk	K1, Splice
0.8 010AM Blk	X32, Splice
0.8 010AN Blk	Y6, Splice
2.0 010AP Blk	Y6, Splice
2.0 010AR Blk	Y6, Splice
0.8 010AT Blk	Y6, Splice
1.0 010B Blk	Splice, M2
3.0 010C Blk	W1, Splice
0.8 010D Blk	X20, Splice
0.8 010E Blk	K2, K1
0.8 010F Blk	K3, K2
0.8 010G Blk	Splice, X28
1.0 010H Blk	Splice, X17
1.0 010K Blk	Splice, X15
0.8 010M Blk	Splice, Y3
3.0 010N Blk	Splice, X1
3.0 010P Blk	W1, Splice
0.8 010R Blk	Splice, X25
0.8 010S Blk	K4, K3
3.0 012A Red	Fuse Block (F4), S2
1.0 042A Red	Fuse Block (F6), Splice
1.0 042B Red	Splice, S13
1.0 042C Red	Splice, K6
1.0 042D Red	Splice, S15
2.0 050A Blk	W1, Splice
0.5 050B Blk	Splice, B4
0.8 050C Blk	Splice, X4
0.8 050D Blk	Splice, X11
0.8 050E Blk	Splice, X7
0.8 050F Blk	Splice, X5
1.0 050U Blk	Splice, K7
1.0 050V Blk	Splice, S13
1.0 072A Red	Splice, G2
1.0 072B Red	S2, Splice
1.0 072C Red	Splice, Fuse Block (F7)
1.0 072D Red	Splice, S13
1.0 102 Red	S13, K7
1.0 103A Org	S3, Splice
1.0 103B Org	Splice, K4
0.8 103C Org	Splice, X7
0.8 116A Blu	S15, K6

Continued on next page

SW03989,0000D32 -19-09NOV10-1/4

Size/No./Color	Wire Connection Points
1.0 118B Gry	Fuse Block (F10), Splice
0.8 118C Gry	Splice, X27
0.8 118D Gry	Splice, X22
1.0 118E Gry	Splice, X13
0.8 118F Gry	Splice, X25
1.0 119A Wht	Fuse Block (F12), X3
3.0 122B Red	Splice, S3
3.0 122C Red	Fuse Block (F5), Splice
1.0 122D Red	Splice, X10
1.0 122E Red	Splice, X10
1.0 122G Red	Splice, S1
1.0 122H Red	Splice, K4
1.0 127A Pur	S14, Splice
1.0 127B Pur	Splice, S13
1.0 127C Pur	Splice, K7
1.0 128B Gry	Fuse Block (F9), Splice
1.0 128C Gry	Splice, X13
0.8 128D Gry	Splice, X30
0.8 128E Gry	Splice, X19
1.0 133A Org	K4, Fuse Block (F9)
1.0 135A Grn	S14, Splice
0.8 135B Grn	Splice, X6
0.8 135C Grn	Splice, S13
1.0 135D Grn	Splice, Splice
0.8 135E Grn	Splice, X18
0.8 135F Grn	Splice, X21
1.0 135G Grn	Splice, X13
1.0 136A Blu	K6, Splice
1.0 136B Blu	Splice, X13
0.8 136C Blu	Splice, X31
0.8 136D Blu	Splice, X23
1.0 137A Pur	S3, Fuse Block (F8)
1.0 137B Pur	Fuse Block (F8), K4
2.0 138A Gry	S3, Fuse Block (F12)
0.8 144 Yel	X11, K7
1.0 145A Grn	S14, Splice
0.8 145B Grn	Splice, X6
0.8 145C Grn	Splice, S13
1.0 145D Grn	Splice, Splice
0.8 145E Grn	Splice, X26
0.8 145F Grn	Splice, X29
1.0 145G Grn	Splice, X13
0.8 146 Blu	X11, K7
2.0 147A Pur	Fuse Block (F8), Splice
1.0 147B Pur	Splice, X16
1.0 147C Pur	Splice, X14
0.8 148 Gry	X11, K7
1.3 212A Red	S2, Splice, K5
0.5 212B Red	Splice, K4
1.3 212C Red	Splice, Fuse Block (F11)
2.0 222A Red	K5, X13
1.0 232 Red	Fuse Block, X40 (Cab Option)

Continued on next page

SW03989,0000D32 -19-09NOV10-2/4

Size/No./Color	Wire Connection Points
0.8 247A Pur	S15, X4
2.0 252A Red	Fuse Block (F4), K5
1.0 302 Red	X1, X7
0.8 304A Yel	K1, X7
2.0 309A Wht	K2, Y1
0.8 325A Grn	Splice, X4
0.8 325B Grn	Splice, X10
1.0 325C Grn	G2, Splice
3.0 329A Wht	K1, X1
1.0 334A Yel	G2, X6
0.8 347A Pur	B2, X10
0.8 351A Brn	B1, X10
0.8 353A Org	B4, X10
0.8 359A Wht	B3, X10
2.0 383A Org	K3, X2
0.8 383C Org	K3, X6
0.8 385A Grn	S2, K3
0.8 518A Gry	X7, K2
0.8 519 Wht	X9, X10
0.8 539A Wht	Splice, X7
0.8 539B Wht	Splice, X4
0.8 539C Wht	S8, Splice
0.8 552A Red	Fuse Block (F11), Splice
0.8 552B Red	Splice, X4
0.8 552C Red	Splice, S15
0.8 555A Grn	S10, X7
0.8 562A Red	Splice, S4
0.8 562B Red	Splice, S12
0.8 562C Red	Splice, B1
1.0 562D Red	Fuse Block (F7), Splice
0.8 562E Red	Splice, S8
1.0 562F Red	Splice, M2
0.8 562G Red	Splice, S5
0.8 562H Red	Splice, X10
0.8 562J Red	Splice, X9
0.8 562K Red	Splice, S10
0.8 562L Red	Splice, X8
0.8 562M Red	Splice, S7
0.8 562N Red	Splice, Splice
0.8 562X Red	Splice, S21
0.8 572A Red	Splice, X7
1.0 572B Red	S2, Splice
1.0 572C Red	Splice, K2
0.5 573 Org	S4, X7
0.8 574A Yel	S4, Y3
0.8 586A Blu	S12, X10
0.8 594A Yel	X8, X11
0.8 733 Org	X11, S21
0.8 737A Pur	S21, Y6
0.8 777A Pur	X6, S7
0.8 903B Org	S1, X3
0.8 908 Gry	S5, X7

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SW03989,0000D32 -19-09NOV10-3/4

Schematics and Harnesses MY08

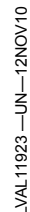
Size/No./Color	Wire Connection Points
0.8 924A Yel	X5, X7
0.8 925A Grn	X5, X7

SW03989,0000D32 -19-09NOV10-4/4

50-20-28

PN=882

PN=882

PN=882

SW03989,0000D33 -19-05NOV10-1/2

Component	Function
K1	Fuel Supply Relay
K2	Start Relay
K3	Manifold Heater Relay
K4	Marker Lights Relay
K5	Trailer Relay
K6	Brake Light Relay
F3	Key Switch Fuse
F4	Trailer Relay Fuse
F5	Horn and Light Switch Fuse
F6	Brake and Hazard Lights Fuse
F7	Switched Power Fuse
F8	Work Lights Fuse
F9	RF and LR Marker Lights Fuse
F10	RR and LF Marker, and License Plate Lights Fuse
F11	Harness Fuse
F12	Head Lights Fuse

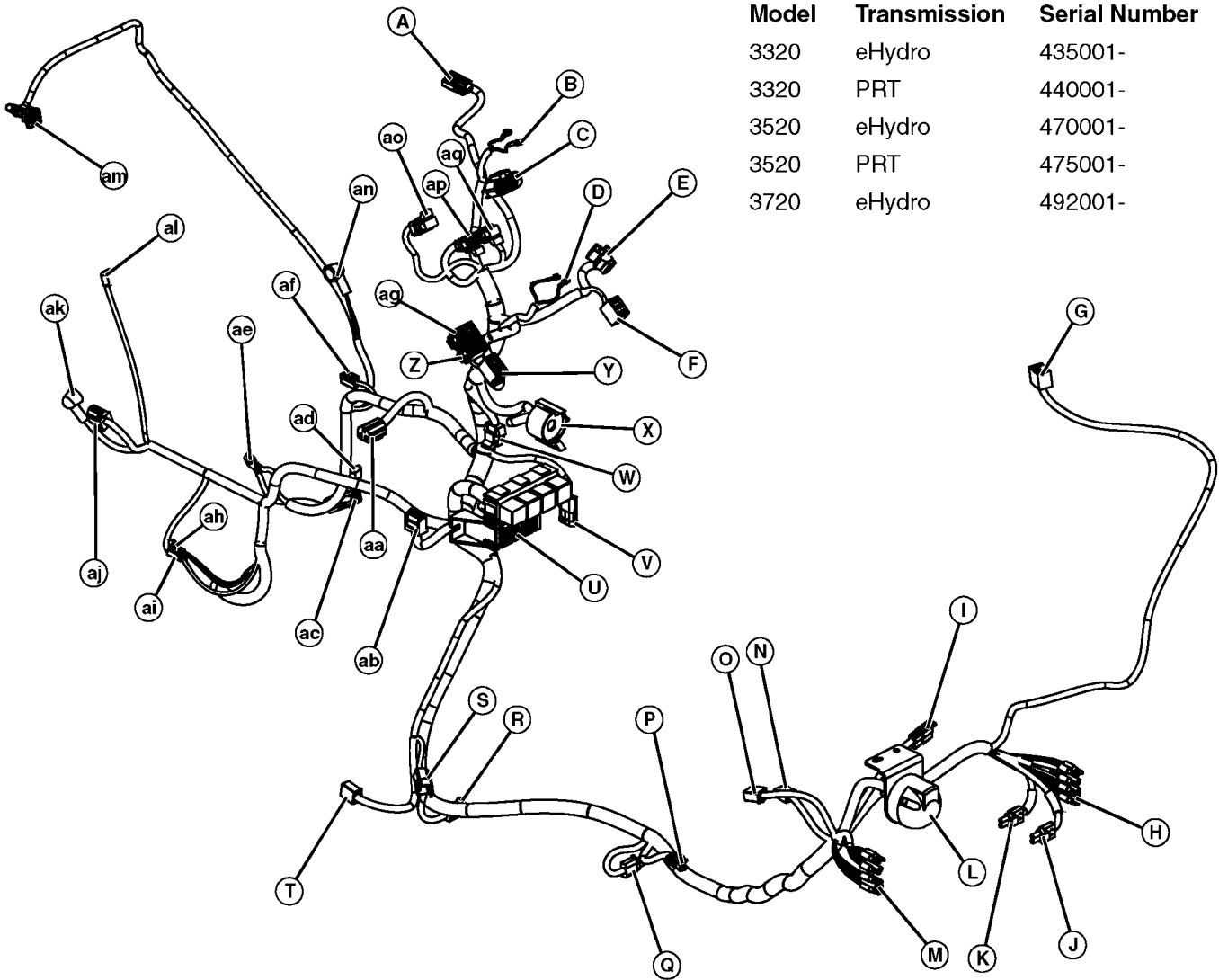
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SW03989,0000D33 -19-05NOV10-2/2

W1 Main Wiring Harness Component Location—MY08

Model	Transmission	Serial Number
3320	eHydro™	435001-
3320	PRT	440001-
3520	eHydro™	470001-
3520	PRT	475001-
3720	eHydro™	492001-

Model	Transmission	Serial Number
3320	eHydro	435001-
3320	PRT	440001-
3520	eHydro	470001-
3520	PRT	475001-
3720	eHydro	492001-



Main Wiring Harness Component Location

LVAL11924—UN—12NOV10

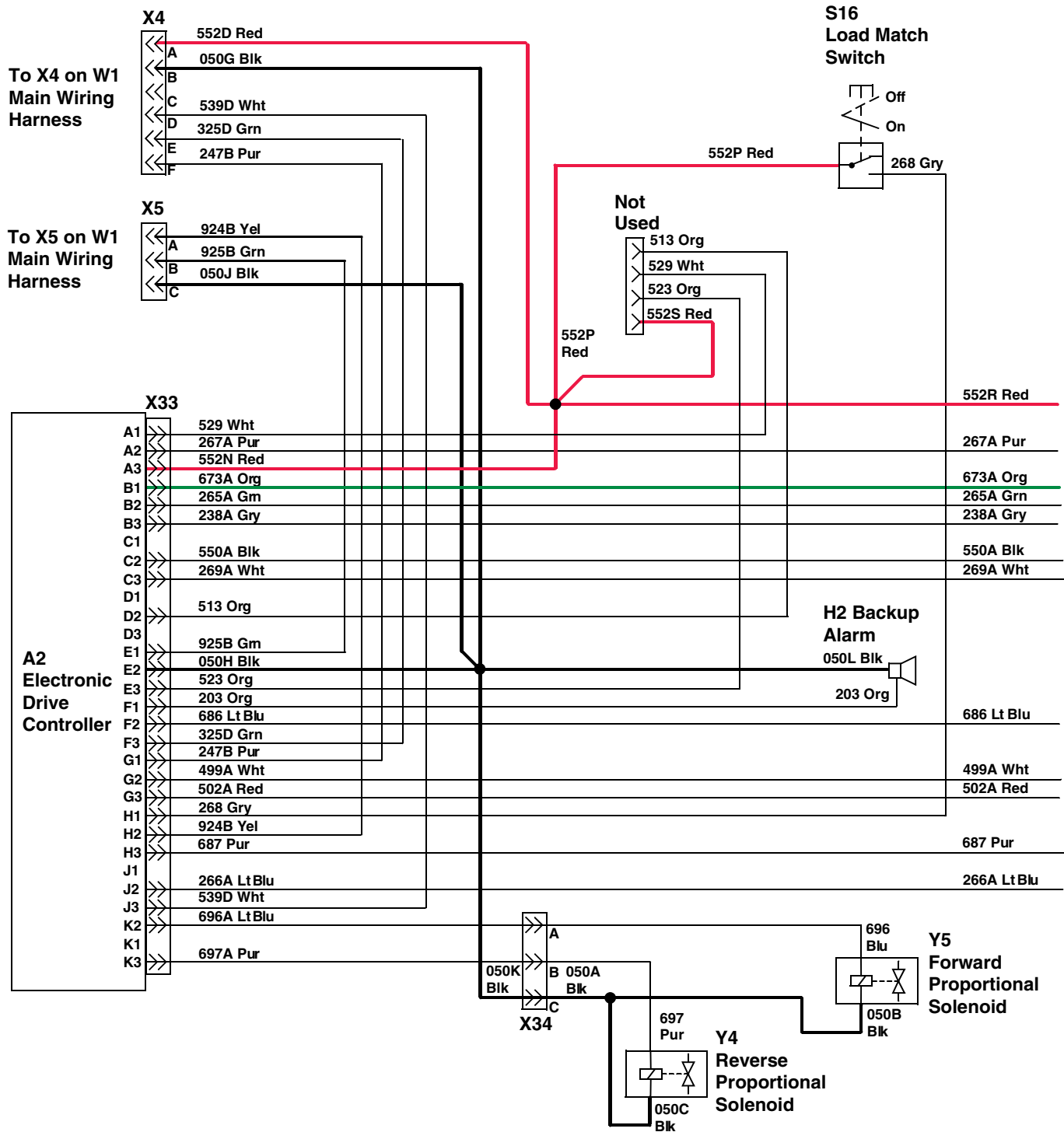
A—X3 Connector to W2 Headlight Wiring Harness	L—X13 Trailer Connector	V—X5 Diagnostic Interface Connector or to W9 Wiring Harness	AH—Y1 Starting Motor Solenoid Battery+
B—B4 Fuel Gauge Sensor	M—LH Tail/Warning Light Connectors to W7 Left Rear Lights Wiring Harness	W—X4 Connector to W9 Wiring Harness	AI— Y1 Starting Motor Solenoid
C—X6 to A1 Display Panel	N—S12 Park Brake Switch	X—S2 Key Switch Connector	AJ—G2 Alternator
D—S1 Horn Switch	O—S8 Seat Switch	Y—S13 Hazard Lights Switch	AK—G2 Alternator Battery+
E—S3 Light Switch	P—Y3 PTO Solenoid	Z—S14 Turn Signal Switch	AL—B3 Engine Coolant temperature Sensor
F—S21 Front PTO Switch	Q—S10 MFWD Engagement Sensing Switch	AA—Y2 Fuel Shutoff Solenoid	AM—B1 Air Restriction Switch
G—S4 Rear PTO Switch	R—S11 Transmission Neutral Switch (PRT) or W4 Jumper eHydro™	AB—K5 Flasher Relay	AN—R1 Manifold Heater
H—RH Tail/Warning Light Connectors to W8 Right Rear Lights Wiring Harness	S—(not used)	AC—Y6 Front PTO Clutch	AO—X11 Connector to A1 Display Panel
I— X25 License Plate Light Connector	T—S15 Brake Switch	AD—B2 Engine Oil Pressure Switch	AP—X10 Connector to A1 Display Panel
J—S7 Rear PTO Sensing Switch	U—Load Center	AE—W1 Ground	AQ—X6 Connector to A1 Display Panel
K—S9 Mid PTO Sensing Switch		AF—M2 Fuel Pump	
		AG—S5 Display Mode Switch	

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SW03989,0000D34 -19-05NOV10-2/2

W9 eHydro™ and Cruise Control Electrical Schematic—MY08

W9 eHydro™ and Cruise Control Electrical Schematic (1 of 2)



LVAL11925—UN—12NOV10

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SW03989,0000D35 -19-19MAY11-1/4

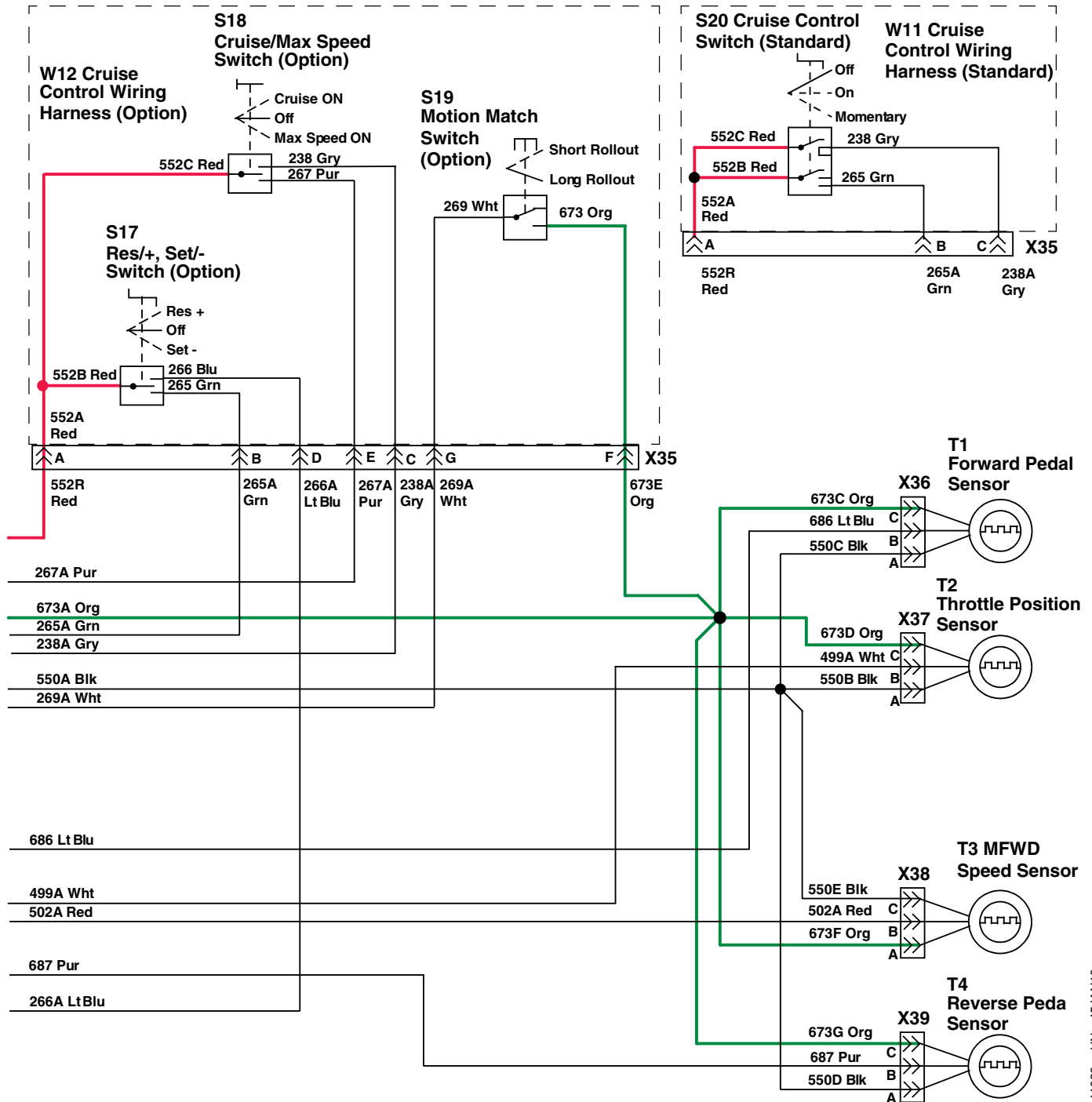
A2—Electronic Drive Controller	X5—W1 Main Wiring Harness	X34— W9 eHydro™ Wiring
H2—Backup Alarm	to W9 eHydro™ Wiring	Harness to W10
S16— Load Match Switch	Harness	Proportional Valve Wiring
W1—Main Wiring Harness	X33— W9 eHydro™ Wiring	Harness
X4—W1 Main Wiring Harness	Harness to A2 Electronic	Y4—Reverse Proportional
to W9 eHydro™ Wiring	Drive Controller	Solenoid
Harness		Y5—Forward Proportional
		Solenoid

eHydro is a trademark of Deere & Company

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SW03989,0000D35 -19-19MAY11-2/4

W9 eHydro™ and Cruise Control Electrical Schematic (2 of 2)



Cruise Control Electrical Schematic

Continued on next page

SW03989,0000D35 -19-19MAY11-3/4

S17— Res/+, Set/- Switch	T4— Reverse pedal Sensor	X35— W9 eHydro™ Wiring Harness to W11 Cruise Control Wiring Harness (standard)	X38— W9 eHydro™ Wiring Harness to T3 MFWD Speed Sensor
S18— Cruise/Max Speed Switch	W11—Cruise Control Wiring Harness (standard)		
S19— Motion Match Switch	W12—Cruise Control Wiring harness (option)	X36— W9 eHydro™ Wiring Harness to T1 Forward Pedal Sensor	X39— W9 eHydro™ Wiring Harness to T4 Reverse Pedal Sensor
S20— Cruise Switch			
T1— Forward Pedal Sensor	X28— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	X37— W9 eHydro™ Wiring Harness to T2 Throttle Position Sensor	
T2— Throttle Position Sensor			
T3— MFWD Speed Sensor			

SW03989,0000D35 -19-19MAY11-4/4

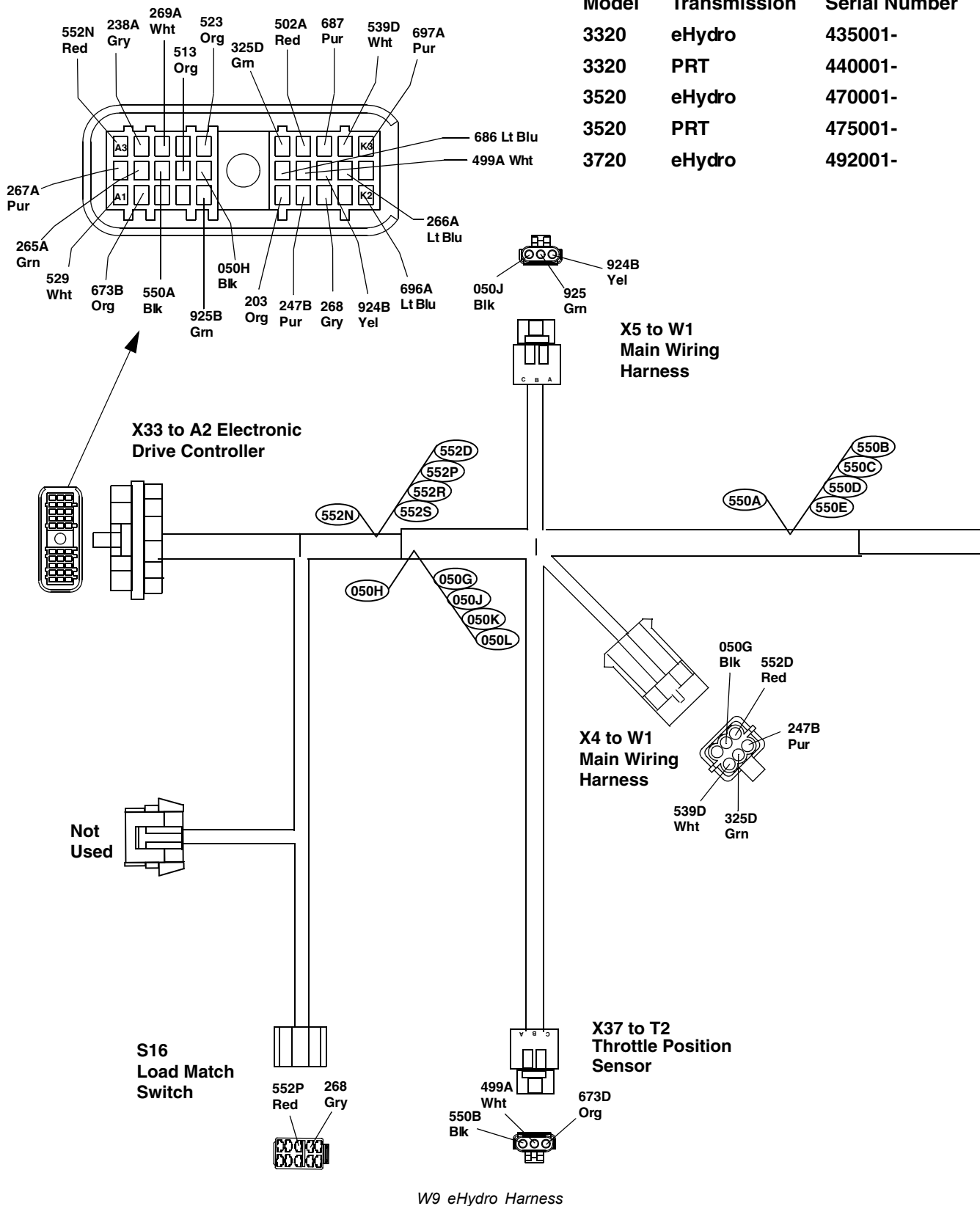
W9 eHydro™ Harness—MY08

Model	Transmission	Serial Number
3320	eHydro™	435001-
3320	PRT	440001-
3520	eHydro™	470001-
3520	PRT	475001-
3720	eHydro™	492001-

Continued on next page

SW03989,0000D36 -19-05NOV10-1/3

Model	Transmission	Serial Number
3320	eHydro	435001-
3320	PRT	440001-
3520	eHydro	470001-
3520	PRT	475001-
3720	eHydro	492001-



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SW03989,0000D36 -19-05NOV10-2/3

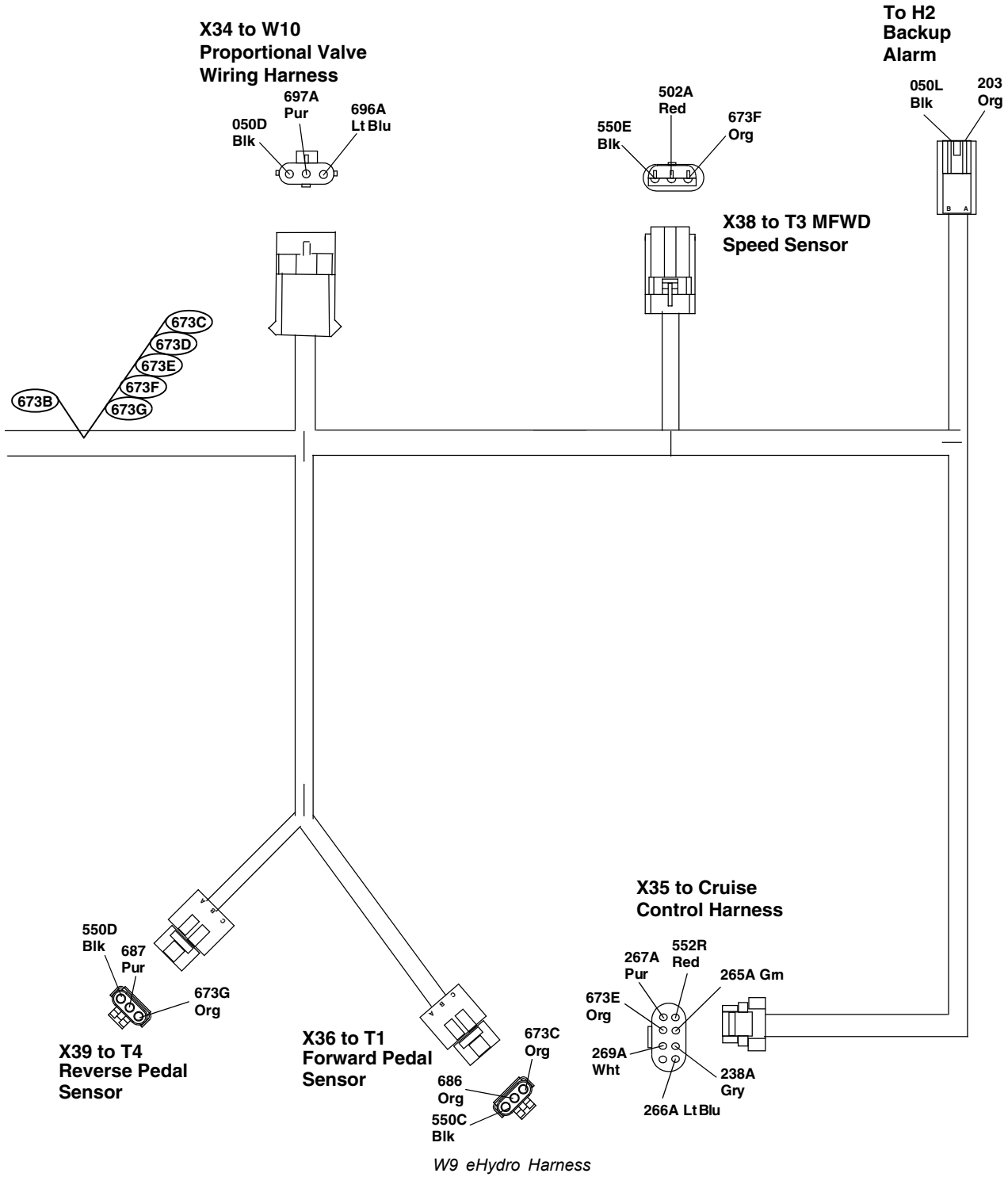
A2—Electronic Drive Controller
S16— Load Match Switch
T2— Throttle Position Sensor
W1—Main Wiring Harness

X4— W1 Main Wiring Harness
to W9 eHydro™ Wiring
Harness
X5— W1 Main Wiring Harness
to W9 eHydro™ Wiring
Harness

X33— W9 eHydro™ Wiring
Harness to A2 Electronic
Drive Controller
X37— W9 eHydro™ Wiring
Harness to T2 Throttle
Position Sensor

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SW03989,0000D36 -19-05NOV10-3/3



LVAL11928—UN—15JAN13

H2—Backup Alarm
T1—Forward Pedal Sensor
T3—MFWD Speed Sensor
T4—Reverse Pedal Sensor
X34—W9 eHydro™ Wiring Harness to W10 Proportional Valve Wiring Harness

X35—W9 eHydro™ Wiring Harness to W11 Cruise Control Wiring Harness (standard)
X36—W9 eHydro™ Wiring Harness to T1 Forward Pedal Sensor

X38—W9 eHydro™ Wiring Harness to T3 MFWD Speed Sensor
X39—W9 eHydro™ Wiring Harness to T4 Reverse Pedal Sensor

SW03989,0000D36 -19-05NOV10-4/3

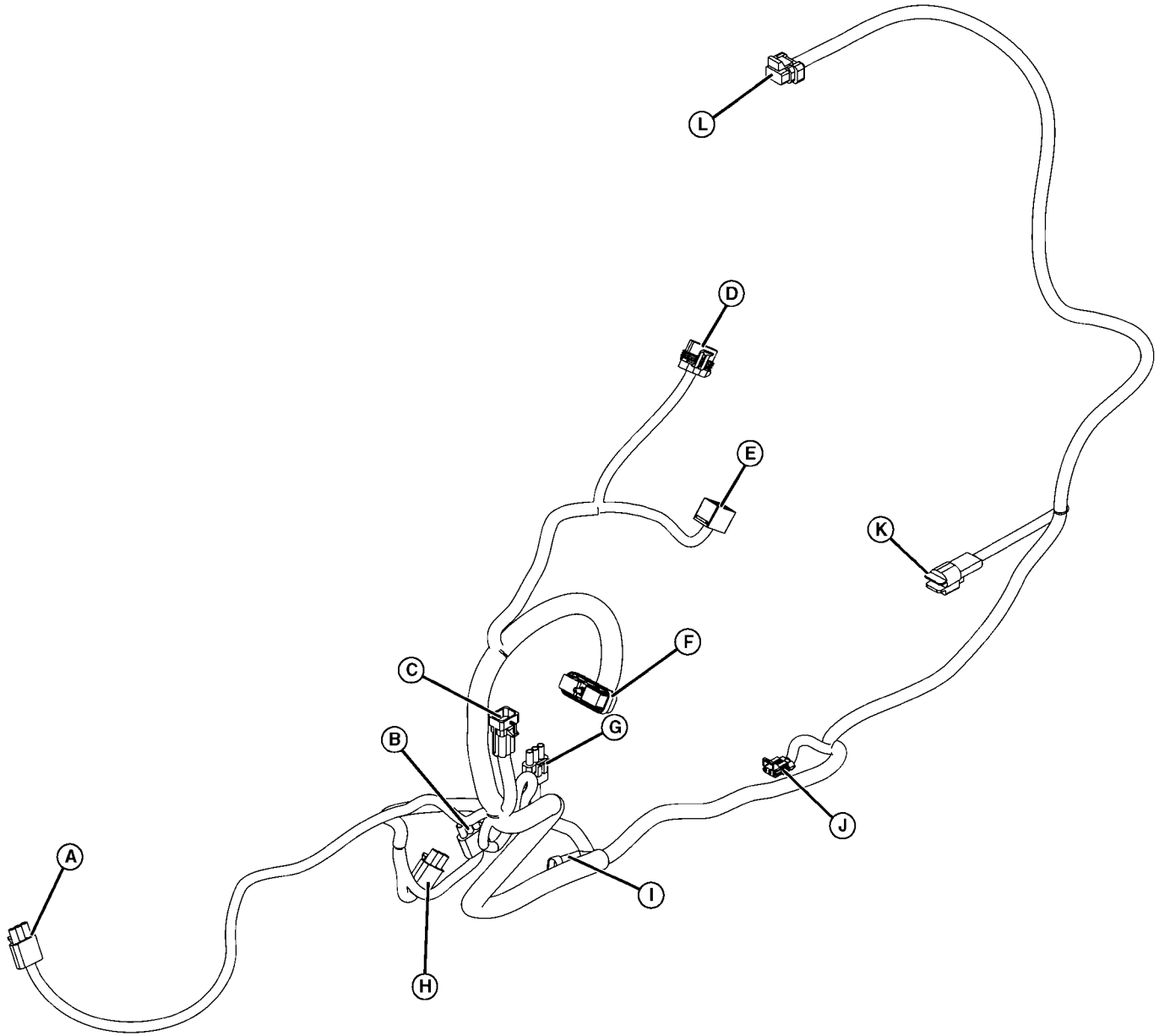
W9 eHydro™/AutoHST Wiring Harness Color Codes—MY08

Size/No./Color	Wire Connection Points
0.8 050G Blk	Splice 050, X4
0.8 050H Blk	X26, Splice 050
0.8 050J Blk	Splice 050, X5
0.8 050K Blk	Splice 050, X34
0.8 050L Blk	Splice 050, H2
0.8 203 Org	X33, H2
0.8 238A Gry	X33, X35
0.8 247B Pur	X33, X4
0.8 265A Grn	X33, X35
0.8 266A Lt Blu	X33, X35
0.8 267A Pur	X33, X35
0.8 268 Gry	X33, S16
0.8 269A Wht	X33, X35
0.8 325D Grn	X33, X4
0.8 499A Wht	X33, T2
0.8 502A Red	X33, T3
0.8 513 Org	X33, S18
0.8 523 Org	X33, S18
0.8 529 Wht	X33, S18
0.8 539D Wht	X4, X33
0.8 550A Blk	X33, Splice 550
0.8 550B Blk	Splice 550, T2
0.8 550C Blk	Splice 550, T1
0.8 550D Blk	Splice 550, T4
0.8 550E Blk	Splice 550, T3
0.8 552D Red	Splice 552, X4
0.8 552N Red	X33, Splice 552
0.8 552P Red	Splice 552, S16
0.8 552R Red	Splice 552, X35
0.8 552S Red	Splice 552, S18
0.8 673B Org	X33, Splice 673
0.8 673C Org	Splice 673, T1
0.8 673D Org	Splice 673, T2
0.8 673E Org	Splice 673, X35
0.8 673F Org	Splice 673, T3
0.8 673G Org	Splice 673, T4
0.8 686 Lt Blu	X33, T1
0.8 687 Pur	X33, T4
0.8 696A Lt Blu	X33, X34
0.8 697A Pur	X33, X34
0.8 924B Yel	X33, X5
0.8 925B Grn	X33, X5

Wiring Harness Color Codes

SW03989,0000D37 -19-05NOV10-1/1

W9 eHydro™/AutoHST Wiring Harness—MY08



Left Front View

- | | | |
|---------------------------|------------------------------|-------------------------------|
| A—T2 Throttle Sensor | E—S12 Load Match Switch | I— X27 Connector to W10 Valve |
| B—T1 Forward Pedal Sensor | F—X33 to A2 Electronic Drive | Wiring Harness |
| C—X4 Connector to W1 Main | Controller | J— T3 MFWD Speed Sensor |
| Wiring Harness | G—T4 Reverse Pedal Sensor | K—H1 Back Up Alarm |
| D—S18 D/N/R Switch | H—X5 Connector to W1 Main | L—X28 Connector to W11 or |
| | Wiring Harness | W12 Cruise Control Wiring |
| | | Harness |

SW03989,0000D38 -19-05NOV10-1/1

LVAL11928 —UN—12NOV10

Main Schematic and Wiring Harness Legend—PRT and eHydro™—MY13

Component Legend:

A1—Display Panel
B1—Air Filter Restriction Switch
B2—Engine Oil Pressure Switch
B3—Engine Coolant Temperature Sensor
B4—Fuel Gauge Sensor
E1—Left Headlight
E2—Right Headlight
E3—Left Work Light
E4—Right Work Light
E5—Right Front Turn/Hazard Light
E6—Right Front Marker Light
E7—Right Rear Turn/Hazard Light
E8—Right Rear Marker Light
E9—Right Brake Light
E10—License Plate Light
E11—Left Front Turn/Hazard Light
E12—Left Front Marker Light
E13—Left Rear Turn/Hazard Light
E14—Left Rear Marker Light
E15—Left Brake Light
F1—Fusible Link
F2—Fusible Link
F3—Fuse 30A
F4—Fuse 20A
F5—Fuse 30A
F6—Fuse 20A
F7—Fuse 20A
F8—Fuse 20A
F9—Fuse 15A
F10—Fuse 15A
F11—Fuse 10A
F12—Fuse 15A
G1—Battery
G2—Alternator
H1—Horn

K1—Fuel Relay
K2—Start Relay
K3—Manifold Heater Relay
K4—Lights Relay
K5—Trailer Relay
K6—Brake Relay
K7—Flasher Relay
M1—Starting Motor
M2—Fuel Pump
R1—Manifold Heater
S1—Horn Switch
S2—Key Switch
S3—Light Switch
S4—Rear PTO Switch
S5—Display Mode Switch
S7—Rear PTO Engagement Sensing Switch
S8—Seat Switch
S9—Mid PTO Switch (optional)
S10—MFWD Engagement Sensing Switch
S11—Transmission Neutral Switch (PRT)
S12—Park Brake Switch
S13—Hazard Lights Switch
S14—Turn Signal Switch
S15—Brake Switch
S21—Front PTO Switch
W1—Battery/Frame Ground
Y1—Starting Motor Solenoid
Y2—Fuel Shutoff Solenoid
Y3—Rear PTO Solenoid
Y6—Front PTO Clutch
X57—Front Implement Detector

Connectors:

X1—W1 Main Wiring Harness to Y2 Fuel Shutoff Solenoid
X2—W1 Main Wiring Harness to R1 Manifold Heater
X3—W1 Main Wiring Harness to W2 Headlight/Horn Wiring Harness
X4—W1 Main Wiring Harness to W9 Wiring Harness
X5—W1 Main Wiring Harness to W9 Wiring Harness

Continued on next page

KN52281,100435E -19-11JAN13-1/2

X6—W1 Main Wiring Harness to A1 Display Panel

X7—W1 Main Wiring Harness to A1 Display Panel

X8—W1 Main Wiring Harness to W3 Jumper Plug (standard), S9 Mid PTO Switch (optional)

X9—W1 Main Wiring Harness to S11 Transmission Neutral Switch (PRT), W4 Jumper Plug (eHydro)TM

X10—W1 Main Wiring Harness to A1 Display Panel

X11—W1 Main Wiring Harness to A1 Display Panel

X13—W1 Main Wiring Harness Trailer Connector

X14—W1 Main Wiring Harness to W5 Left Work Light Wiring Harness (optional)

X15—W1 Main Wiring Harness to W5 Left Work Light Wiring Harness (optional)

X16—W1 Main Wiring Harness to W6 Right Work Light Wiring Harness (optional)

X17—W1 Main Wiring Harness to W6 Right Work Light Wiring Harness (optional)

X18—W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness

X19—W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness

X20—W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness

X21—W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness

X22—W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness

X23—W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness

X24—W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness

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X25—W1 Main Wiring Harness to E10 License Plate Light

X26—W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness

X27—W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness

X28—W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness

X29—W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness

X30—W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness

X31—W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness

X32—W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness

X40—W1 Main Wiring Harness to W13 Cab Wiring Harness

Wiring Harnesses:

W1—Main Wiring Harness

W2—Headlight/Horn Wiring Harness

W3—Jumper Plug

W4—Jumper Plug

W5—Right Work Light Wiring Harness (optional)

W6—Left Work Light Wiring Harness (optional)

W7—Left Rear Lights Wiring Harness

W8—Right Rear Lights Wiring Harness

KN52281,100435E -19-11JAN13-2/2

eHydro™—Schematic and Wiring Harness Legend—MY13

A2—Electronic Drive Controller

H2—Backup Alarm

S16—Load Match Switch

S17—Res/+, Set/- Switch (optional)

S18—Cruise Control/Max Speed Switch (optional)

S19—Motion Match Switch (optional)

S20—Cruise Control Switch (standard)

T1—Forward Pedal Sensor

T2—Throttle Position Sensor

T3—MFWD Speed Sensor

T4—Reverse Pedal Sensor

Y4—Reverse Proportional Solenoid

Y5—Forward Proportional Solenoid

Connectors:

X33—W9 Wiring Harness to A2 Electronic Drive Controller

X34—W9 Wiring Harness to W10 Proportional Valve Wiring Harness

X35—W9 Wiring Harness to W11 Cruise Control Wiring Harness (standard)

X35—W9 Wiring Harness to W12 Cruise Control Wiring Harness (optional)

X36—W9 Wiring Harness to T1 Forward Pedal Sensor

X37—W9 Wiring Harness to T2 Throttle Position Sensor

X38—W9 Wiring Harness to T3 MFWD Speed Sensor

X39—W9 Wiring Harness to T4 Reverse Pedal Sensor

Wiring Harnesses:

W9—Wiring Harness

W10—Proportional Valve Wiring Harness

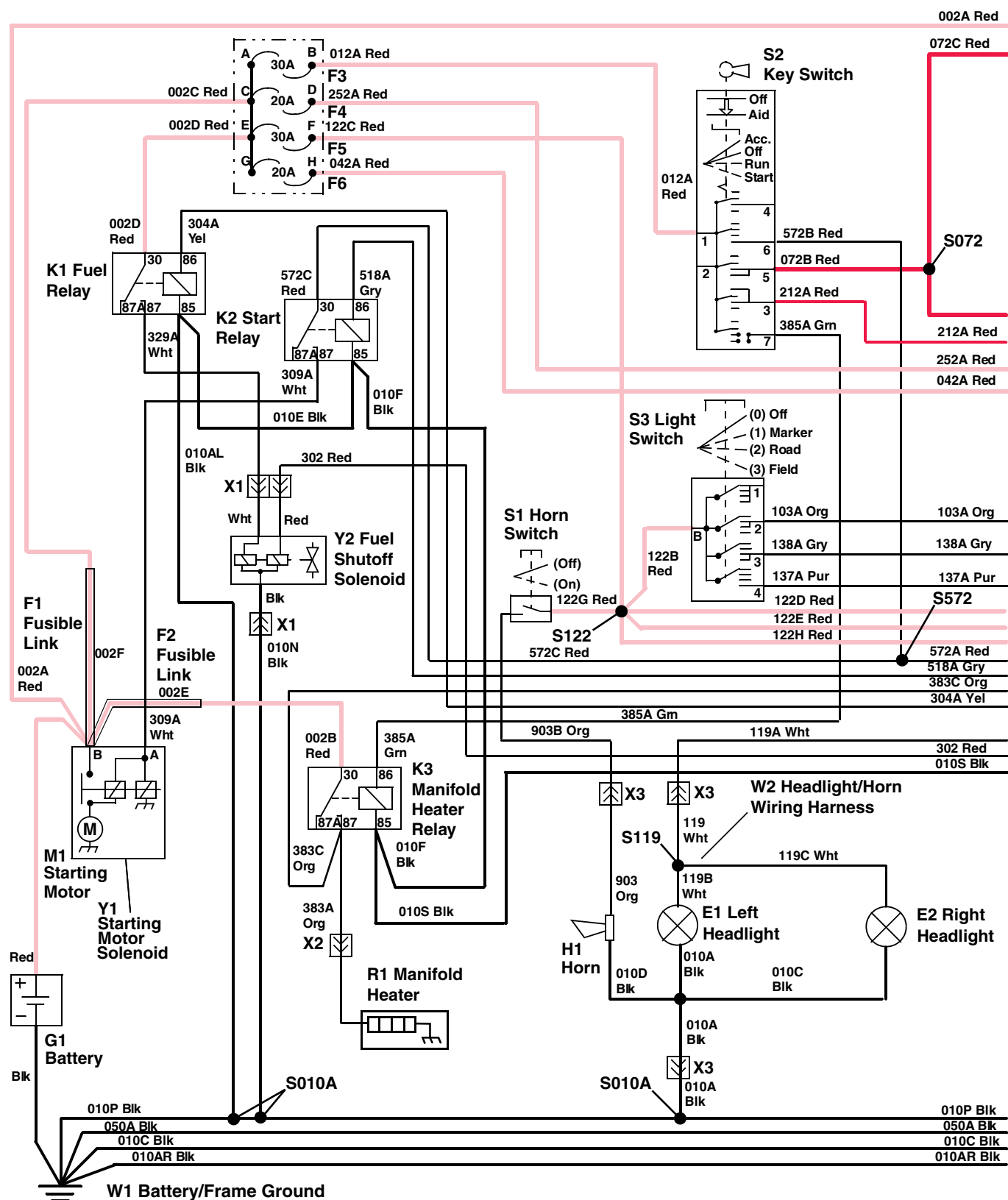
W11—Cruise Control Wiring Harness (standard)

W12—Cruise Control Wiring Harness (optional)

W13—Cab Wiring Harness (optional)

KN52281,100435F -19-14DEC12-1/1

Main Electrical Schematic—MY13



Main Electrical Schematic

Continued on next page

KN52281,1004360 -19-11JAN13-1/12

E1—Left Headlight
E2—Right Headlight
F1—Fusible Link
F2—Fusible Link
F3—Fuse 30A
F4—Fuse 20A
F5—Fuse 30A
F6—Fuse 20A
G1—Battery

H1—Horn
K1—Fuel relay
K2—Start Relay
K3—Manifold Heater Relay
M1—Starting Motor
R1—Manifold Heater
S1—Horn Switch
S2—Key Switch

S3—Light Switch
W2—Headlight/Horn Wiring
Harness
X1—W1 Main Wiring Harness to
Y2 Fuel Shutoff Solenoid
X2—W1 Main Wiring Harness to
R1 Manifold Heater

X3—W1 Main Wiring Harness to
W2 Headlight/Horn Wiring
Harness
Y1—Starting Motor Solenoid
Y2—Fuel Shutoff Solenoid

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KN52281,1004360 -19-11JAN13-2/12



Main Electrical Schematic

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KN52281,1004360 -19-11JAN13-3/12

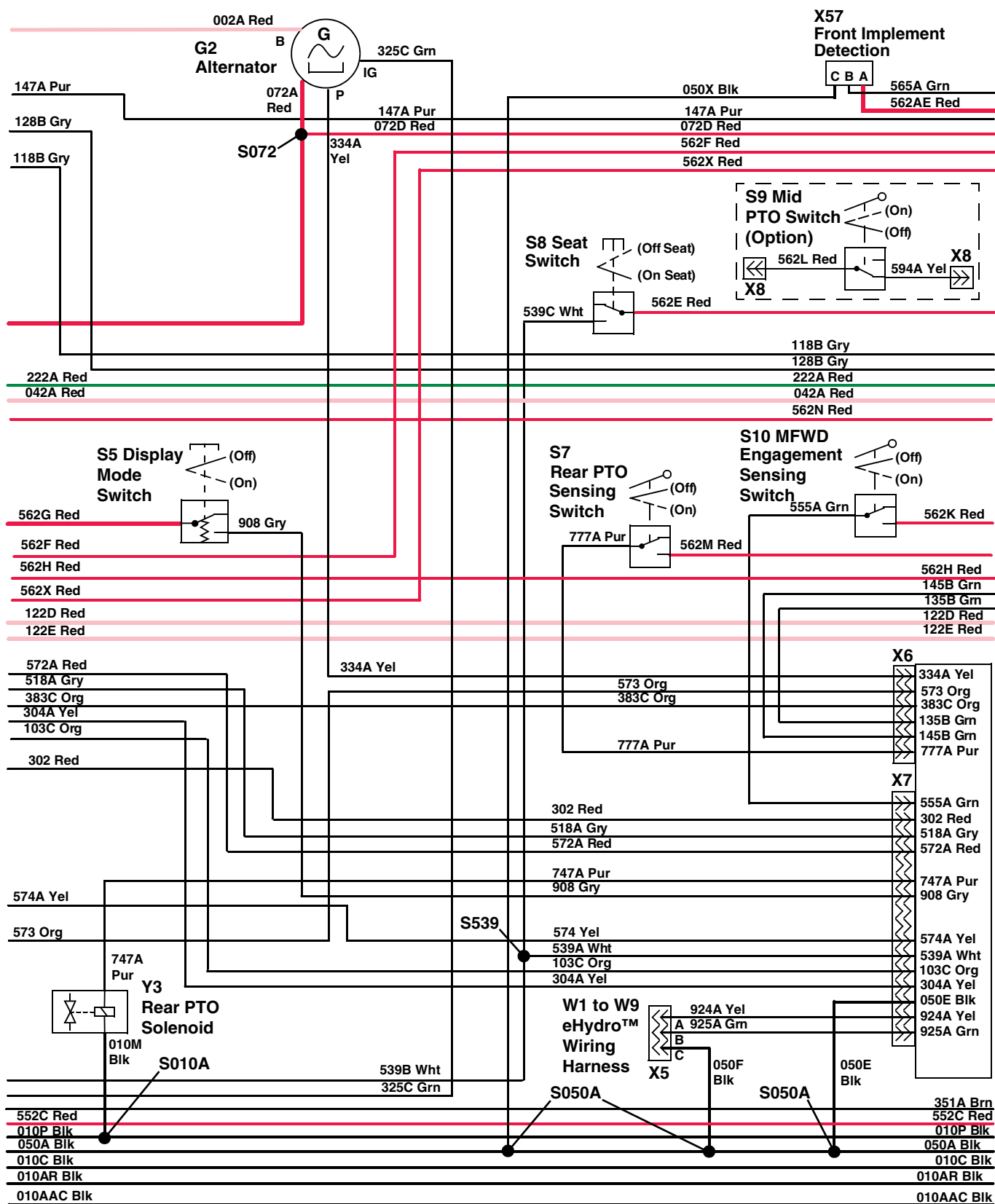
B1—Air Filter Restriction Switch
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 15A

F10— Fuse 15A
F11— Fuse 10A
F12— Fuse 15A
K4—Lights Relay
K5— Trailer Relay

S4— Rear PTO Switch
X4— W1 Main Wiring Harness to
W9 Wiring Harness
X40— W1 Main Wiring Harness to
W13 Cab Wiring Harness

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KN52281,1004360 -19-11JAN13-4/12



Main Electrical Schematic

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KN52281,1004360 -19-11JAN13-5/12

G2—Alternator
 S5—Display Mode Switch
 S7—Rear PTO Engagement
 Sensing Switch
 S8—Seat Switch
 S9—Mid PTO Switch (optional)

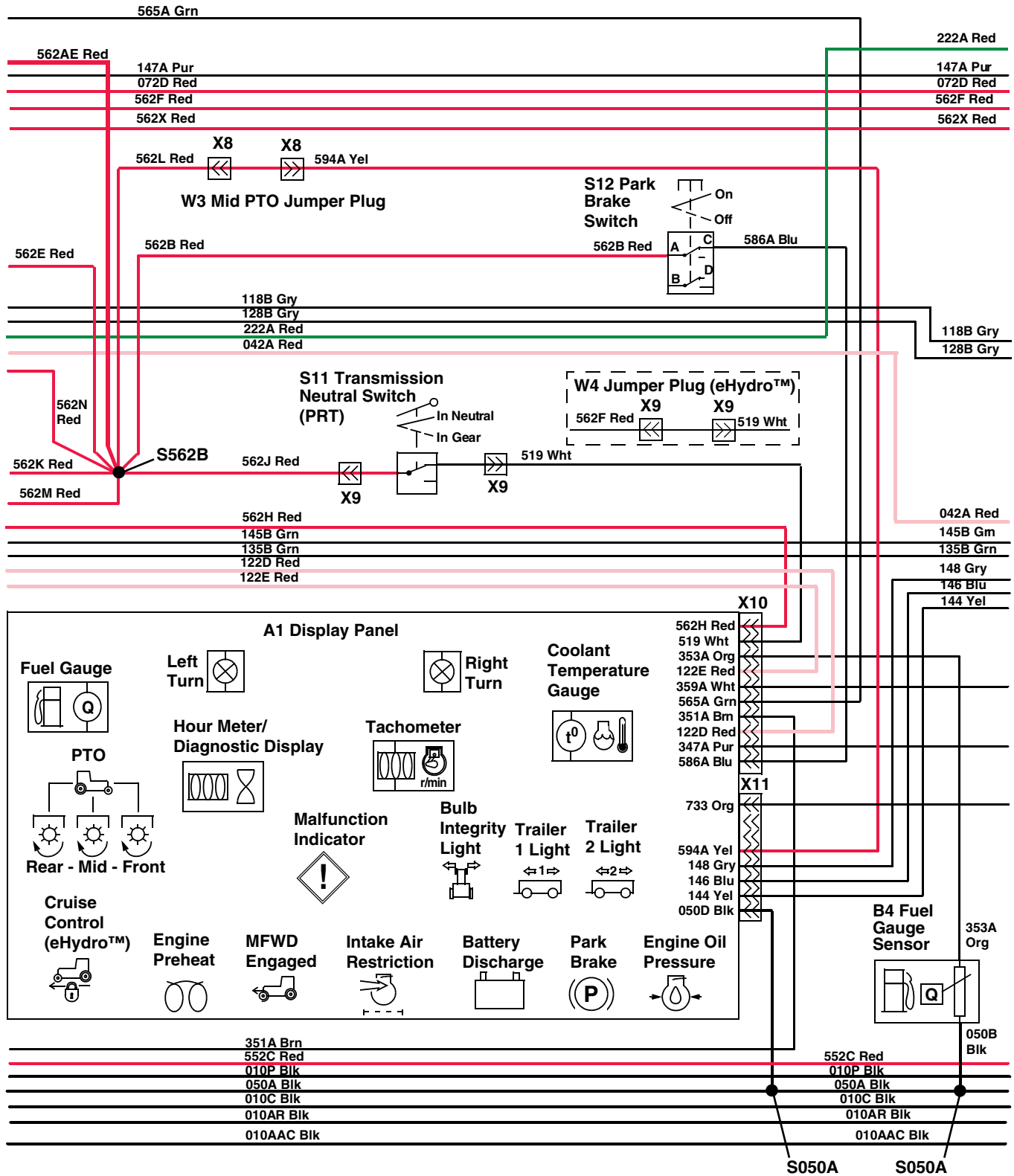
S10— MFWD Engagement
 Sensing Switch
 X5— W1 Main Wiring Harness to
 W9 Wiring Harness
 X6— W1 Main Wiring Harness to
 A1 Display Panel

X7— W1 Main Wiring Harness to
 A1 Display Panel
 X8— W1 Main Wiring Harness to
 W3 Jumper Plug (standard),
 S9 Mid PTO Switch (optional)

Y3—Rear PTO Solenoid
 X57— Front Implement Detection

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KN52281,1004360 -19-11JAN13-6/12



Main Electrical Schematic

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KN52281,1004360 -19-11JAN13-7/12

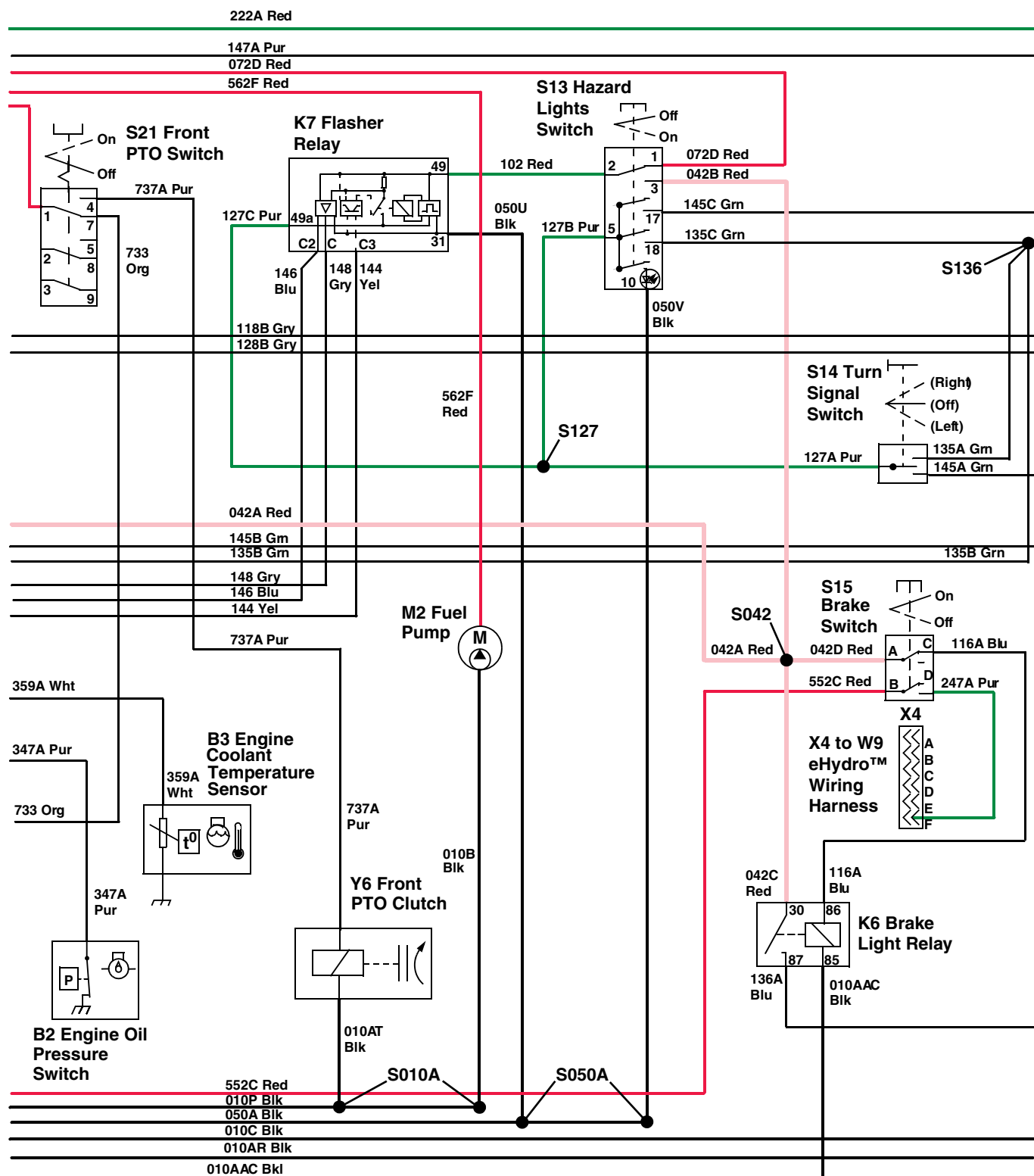
LVAL38875—UN—15JAN13

A1—Display Panel	W4—Jumper Plug	X10— W1 Main Wiring Harness
B4—Fuel Gauge Sensor	X8— W1 Main Wiring Harness to	to A1 Display Panel
S11— Transmission Neutral	W3 Jumper Plug (standard),	X11— W1 Main Wiring Harness
Switch (PRT)	S9 Mid PTO Switch (optional)	to A1 Display Panel
S12— Park Brake Switch	X9— W1 Main Wiring Harness to	
W3—Mid PTO Jumper	S11 Transmission Neutral	
	Switch (PRT), W4 Jumper	
	Plug (eHydro™)	

eHydro is a trademark of Deere & Company

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KN52281,1004360 -19-11JAN13-8/12



Main Electrical Schematic

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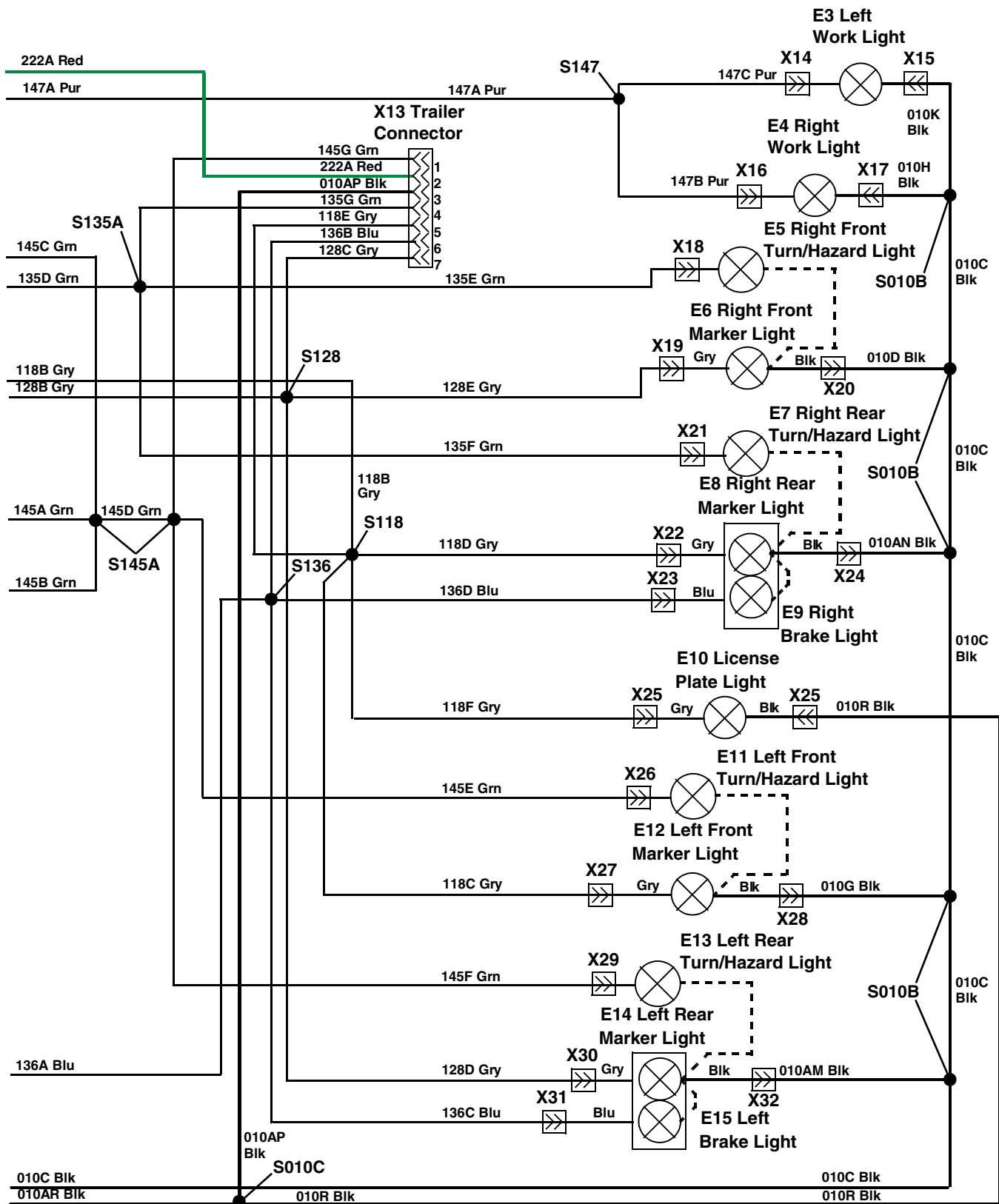
KN52281,1004360 -19-11JAN13-9/12

LVAL38876—UN—15JAN13

B2—Engine Oil Pressure Switch	K7—Flasher Relay	S15— Brake Switch	Y6— Front PTO Clutch
B3—Engine Coolant Temperature Sensor	M2—Fuel Pump	S21— Front PTO Switch	
K6—Brake Light Relay	S13— Hazard Lights Switch	X4— W1 Main Wiring Harness to W9 Wiring Harness	
	S14— Turn Signal Switch		

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KN52281,1004360 -19-11JAN13-10/12



Main Electrical Schematic

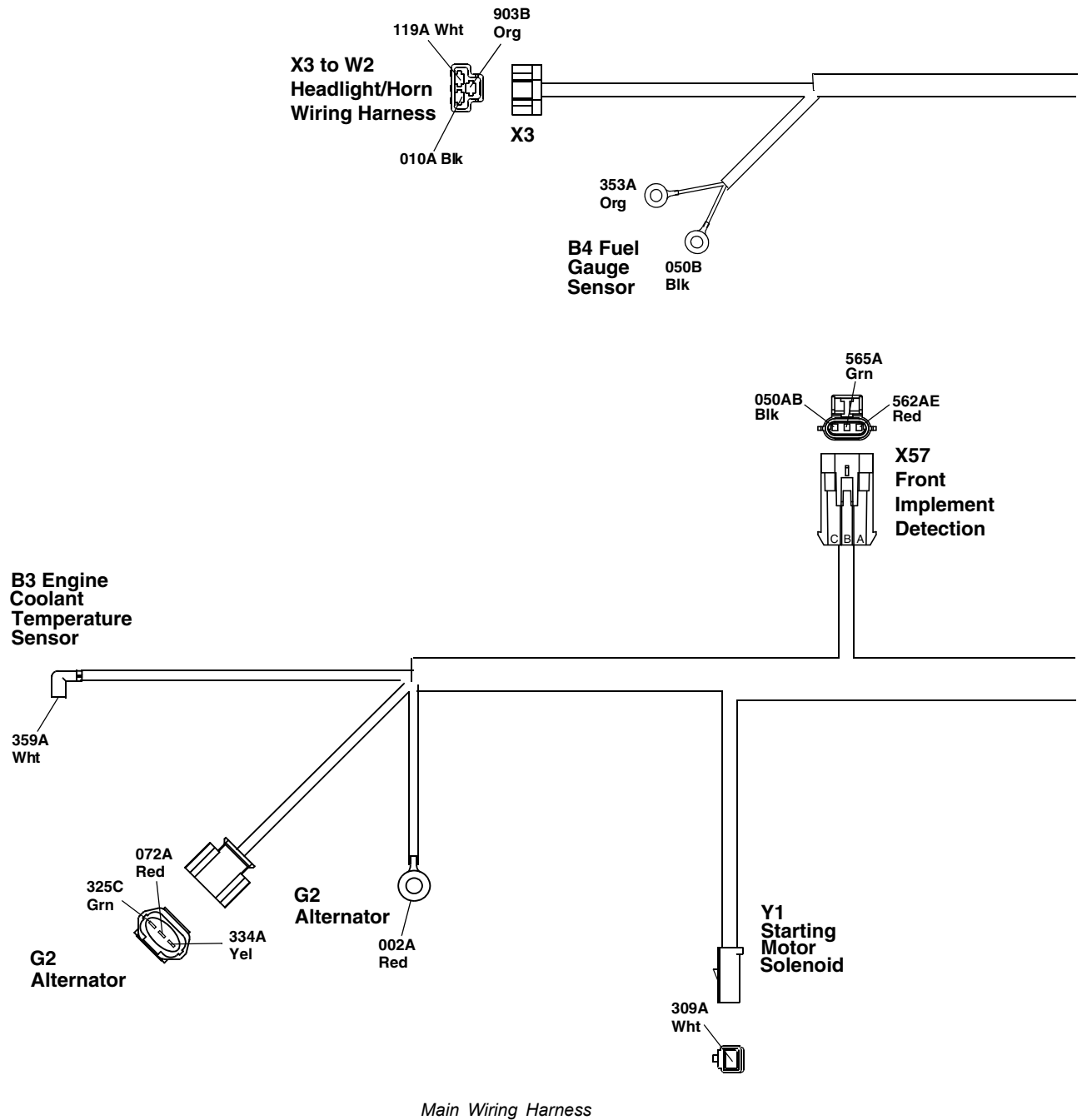
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KN52281,1004360 -19-11JAN13-11/12

E3— Left Work Light	X15— W1 Main Wiring Harness to W5 Left Work Light Wiring Harness (optional)	X21— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X28— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E4— Right Work Light	X16— W1 Main Wiring Harness to W6 Right Work Light Wiring Harness (optional)	X22— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X29— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E5— Right Front Turn/Hazard Light	X17— W1 Main Wiring Harness to W6 Right Work Light Wiring Harness (optional)	X23— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X30— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E6— Right Front Marker Light	X18— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X24— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X31— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E7— Right Rear Turn/Hazard Light	X19— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X25— W1 Main Wiring Harness to E10 License Plate Light	X32— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E8— Right Rear Marker Light	X20— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X26— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
E9— Right Brake Light		X27— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
E10— License Plate Light			
E11— Left Front Turn/Hazard Light			
E12— Left Front Marker Light			
E13— Left Rear Turn/Hazard Light			
E14— Left Rear Marker Light			
E15— Left Brake Light			
X13— W1 Main Wiring Harness Trailer Connector			
X14— W1 Main Wiring Harness to W5 Left Work Light Wiring Harness (optional)			

KN52281,1004360 -19-11JAN13-12/12

W1 Main Wiring Harness—MY13



LVAL38851 —UN—15JAN13

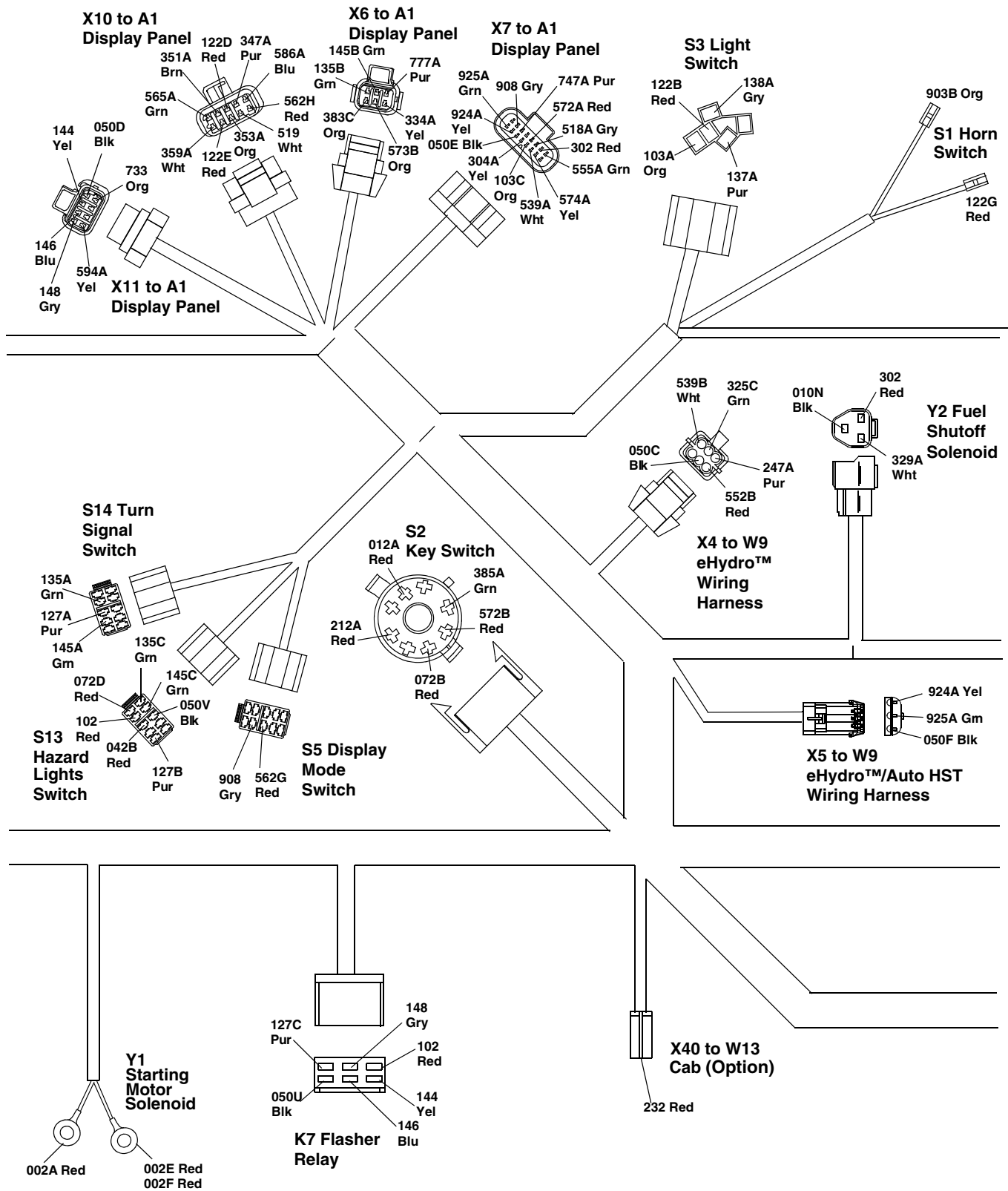
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KN52281,1004361 -19-10JAN13-1/7

B3—Engine Coolant Temperature Sensor	G2—Alternator	Y1— Starting Motor Solenoid
B4—Fuel gauge Sensor	X3— W1 Main Wiring Harness to W2 Headlight/Horn Wiring Harness	X57— Front Implement Detector

Continued on next page

KN52281,1004361 -19-10JAN13-2/7



Main Wiring Harness

Continued on next page

KN52281,1004361 -19-10JAN13-3/7

LVAL38852—UN—15JAN13

A1—Display Panel
 K7—Flasher Relay
 S1—Horn Switch
 S2—Key Switch
 S3—Light Switch
 S5—Display Mode Switch
 S13—Hazard Lights Switch
 S14—Turn Signal Switch

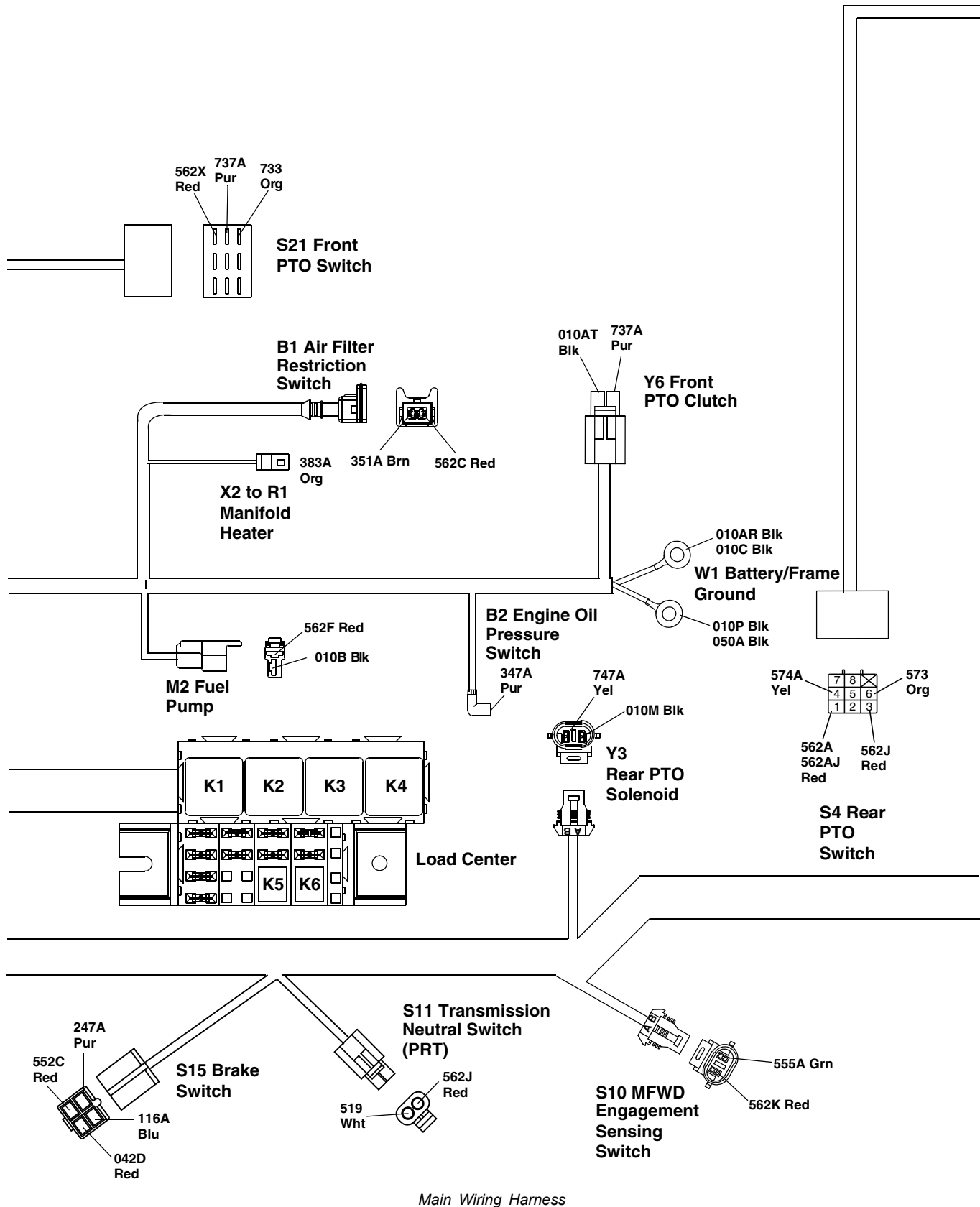
W13—Cab Wiring Harness
 (optional)
 X4—W1 Main Wiring Harness to
 W9 Wiring Harness
 X5—W1 Main Wiring Harness to
 W9 Wiring Harness
 X6—W1 Main Wiring Harness to
 A1 Display Panel

X7—W1 Main Wiring Harness to
 A1 Display Panel
 X10—W1 Main Wiring Harness
 to A1 Display Panel
 X11—W1 Main Wiring Harness
 to A1 Display Panel
 X40—W1 Main Wiring Harness to
 W13 Cab Wiring Harness

Y1—Starting Motor Solenoid
 Y2—Fuel Shutoff Solenoid

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KN52281,1004361 -19-10JAN13-4/7



LVAL38853—UN—15JAN13

Continued on next page

KN52281,1004361 -19-10JAN13-5/7

B1—Air Filter Restriction Switch
B2—Engine Oil Pressure Switch
M2—Fuel Pump
R1—Manifold Heater

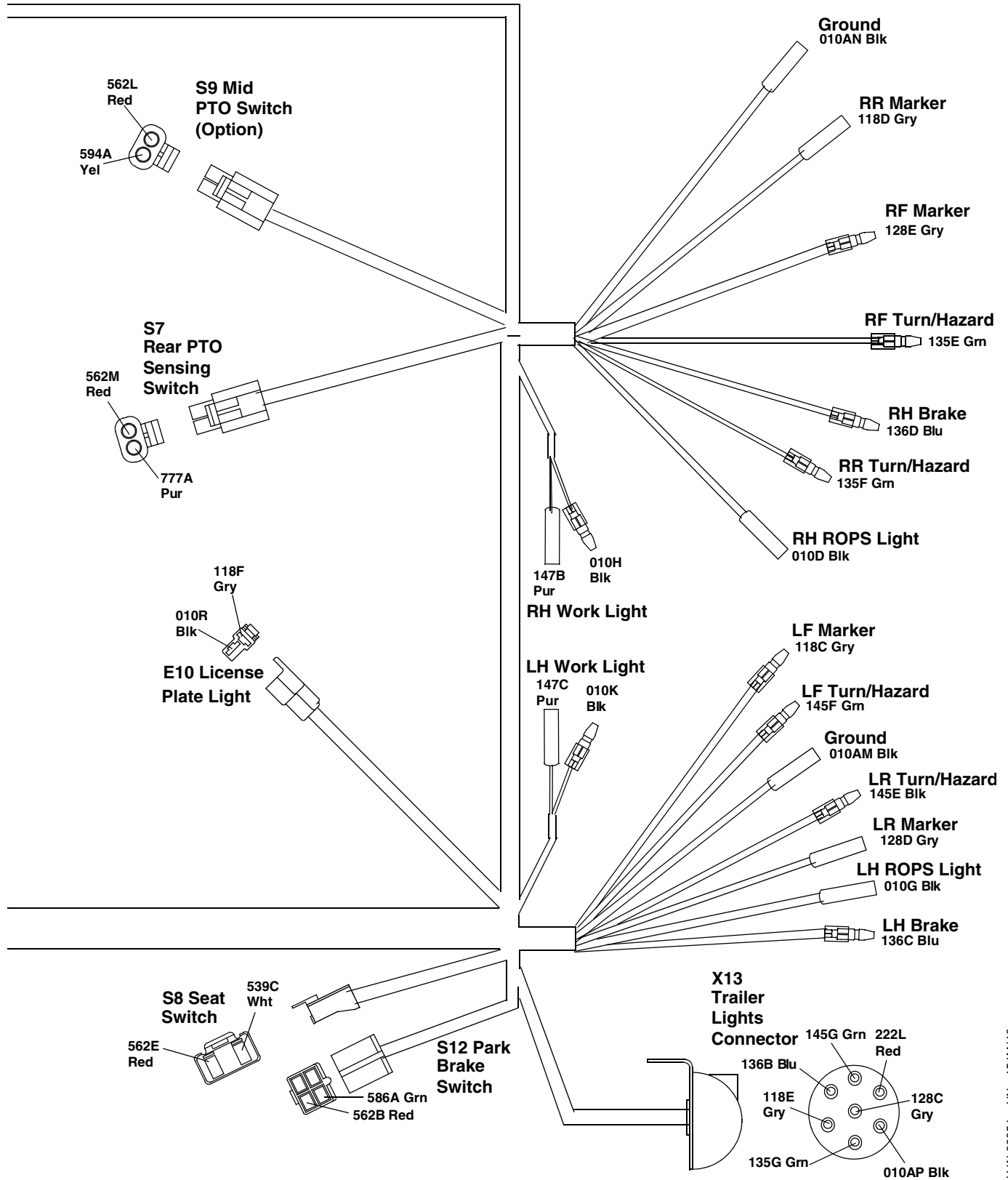
S4—Rear PTO Switch
S10—MFWD Engagement
Sensing Switch
S11—Transmission Neutral
Switch (PRT)

S15—Brake Switch
S21—Front PTO Switch
W1—Battery/Frame Ground
X2—W1 Main Wiring Harness to
R1 Manifold Heater

Y3—Rear PTO Solenoid
Y6—Front PTO Clutch

Continued on next page

KN52281,1004361 -19-10JAN13-6/7



Main Wiring Harness

E10— License Plate Light
S7—Rear (540) PTO Sensing Switch

S8—Seat Switch
S9—Mid PTO Sensing Switch (optional)

S12— Park Brake Switch
X13— W1 Main Wiring Harness Trailer Connector

KN52281,1004361 -19-10JAN13-7/7

LVAL38854—UN—15JAN13

W1 Main Wiring Harness Color Codes—MY13

Size/No./Color	Wire Connection Points
5.0 002A Red	Y1, G2
5.0 002B Red	Splice, K3
5.0 002C Red	Splice, Fuse Block (F4)
5.0 002D Red	Fuse Block (F5), K1
2.0 002E	Splice, Y1
2.0 002F	Splice, Y1
1.0 010A Blk	Splice, K6
0.8 010AAC Blk	K5, K6
0.8 010AK Blk	K4, K5
0.8 010AL Blk	K1, Splice
0.8 010AM Blk	X32, Splice
0.8 010AN Blk	RR Light Ground, Splice
2.0 010AP Blk	X13, Splice
2.0 010AR Blk	W1, Splice
0.8 010AT Blk	Y6, Splice
1.0 010B Blk	Splice, M2
3.0 010C Blk	W1, Splice
0.8 010D Blk	X20, Splice
0.8 010E Blk	K2, K1
0.8 010F Blk	K3, K2
0.8 010G Blk	Splice, LT Rops Lamp
1.0 010H Blk	Splice, RT Work Light
1.0 010K Blk	Splice, LT Work Light
0.8 010M Blk	Splice, Y3
3.0 010N Blk	Splice, Y2
3.0 010P Blk	W1, Splice
0.8 010R Blk	Splice, E10
0.8 010S Blk	K4, K3
3.0 012A Red	Fuse Block (F3), S2
1.0 042A Red	Fuse Block (F6), Splice
1.0 042B Red	Splice, S13
1.0 042C Red	Splice, K6
1.0 042D Red	Splice, S15
2.0 050A Blk	W1, Splice
0.8 050AB Blk	Splice, X57
0.8 050B Blk	Splice, B4
0.8 050C Blk	Splice, X4
0.8 050D Blk	Splice, X11
0.8 050E Blk	Splice, X7
0.8 050F Blk	Splice, X5
1.0 050U Blk	Splice, K7
1.0 050V Blk	Splice, S13
0.8 072A Red	Splice, G2
1.0 072B Red	S2, Splice
1.0 072C Red	Splice, Fuse Block (F7)
1.0 072D Red	Splice, S13
1.0 102 Red	S13, K7
1.0 103A Org	S3, Splice
1.0 103B Org	Splice, K4
0.8 103C Org	Splice, X7

Continued on next page

KN52281,1004362 -19-14DEC12-1/4

Size/No./Color	Wire Connection Points
0.8 116A Blu	S15, K6
1.0 118B Gry	Fuse Block (F10), Splice
0.8 118C Gry	Splice, LF Marker
0.8 118D Gry	Splice, RR Marker
1.0 118E Gry	Splice, X13
0.8 118F Gry	Splice, E10
1.0 119A Wht	Fuse Block (F12), X3
3.0 122B Red	Splice, S3
3.0 122C Red	Fuse Block (F5), Splice
1.0 122D Red	Splice, X10
1.0 122E Red	Splice, X10
1.0 122G Red	Splice, S1
1.0 122H Red	Splice, K4
1.0 127A Pur	S14, Splice
1.0 127B Pur	Splice, S13
1.0 127C Pur	Splice, K7
1.0 128B Gry	Fuse Block (F9), Splice
1.0 128C Gry	Splice, X13
0.8 128D Gry	Splice, LR Marker
0.8 128E Gry	Splice, RF Marker
1.0 133A Org	K4, Fuse Block (F10)
1.0 135A Grn	S14, Splice
0.8 135B Grn	Splice, X6
0.8 135C Grn	Splice, S13
1.0 135D Grn	Splice, Splice
0.8 135E Grn	Splice, RF Turn Haz/Lamp
0.8 135F Grn	Splice, RR Turn Haz
1.0 135G Grn	Splice, X13
1.0 136A Blu	K6, Splice
1.0 136B Blu	Splice, X13
0.8 136C Blu	Splice, L Brake
0.8 136D Blu	Splice, R Brake
1.0 137A Pur	S3, Fuse Block (F8)
1.0 137C Pur	Fuse Block (F8), K4
2.0 138A Gry	S3, Fuse Block (F12)
0.8 144 Yel	X11, K7
1.0 145A Grn	S14, Splice
0.8 145B Grn	Splice, X6
0.8 145C Grn	Splice, S13
1.0 145D Grn	Splice, Splice
0.8 145E Grn	Splice, LF Turn / Haz Lamp
0.8 145F Grn	Splice, LR Haz/ Lamp
1.0 145G Grn	Splice, X13
0.8 146 Blu	X11, K7
2.0 147A Pur	Fuse Block (F8), Splice
1.0 147B Pur	Splice, R Work Light
1.0 147C Pur	Splice, L Work Light
0.8 148 Gry	X11, K7
1.0 212A Red	S2,K5
1.0 212C Red	F7,K5
2.0 222L Red	K5, X13
1.0 232 Red	Fuse Block, X40 (Cab Option)

Continued on next page

KN52281,1004362 -19-14DEC12-2/4

Size/No./Color	Wire Connection Points
0.8 247A Pur	S15, X4
2.0 252A Red	Fuse Block (F4), K5
1.0 302 Red	Y2, X7
0.8 304A Yel	K1, X7
2.0 309A Wht	K2, Y1
1.0 325C Grn	G2, X4
3.0 329A Wht	K1, Y2
1.0 334A Yel	G2, X6
0.8 347A Pur	B2, X10
0.8 351A Brn	B1, X10
0.8 353A Org	B4, X10
0.8 359A Wht	B3, X10
3.0 383A Org	K3, R1
0.8 383C Org	K3, X6
0.8 385A Grn	S2, K3
0.8 518A Gry	X7, K2
0.8 519 Wht	S11, X10
0.8 539A Wht	Splice, X7
0.8 539B Wht	Splice, X4
0.8 539C Wht	S8, Splice
0.8 552A Red	Fuse Block (F11), Splice
0.8 552B Red	Splice, X4
0.8 552C Red	Splice, S15
0.8 555A Grn	S10, X7
0.8 562AE Red	Splice,X57
0.8 562AG Red	Splice,Splice
0.8 562AJ Red	S4,S4
0.8 562A Red	Splice, S4
0.8 562B Red	Splice, S12
0.8 562C Red	Splice, B1
1.0 562D Red	Fuse Block (F7), Splice
0.8 562E Red	Splice, S8
1.0 562F Red	Splice, M2
0.8 562G Red	Splice, S5
0.8 562H Red	Splice, X10
0.8 562J Red	Splice, S11
0.8 562K Red	Splice, S10
0.8 562L Red	Splice, S9
0.8 562M Red	Splice, S7
0.8 562N Red	Splice, Splice
0.8 562X Red	Splice, S21
0.8 565A Grn	X57,X10
0.8 572A Red	Splice, X7
1.0 572B Red	S2, Splice
1.0 572C Red	Splice, K2
0.8 573 Org	S4, X6
0.8 574A Yel	S4, X7
0.8 586A Blu	S12, X10
0.8 594A Yel	X8, S9
0.8 733 Org	X11, S21
0.8 737A Pur	S21, Y6
0.8 747A Pur	Y3,X7

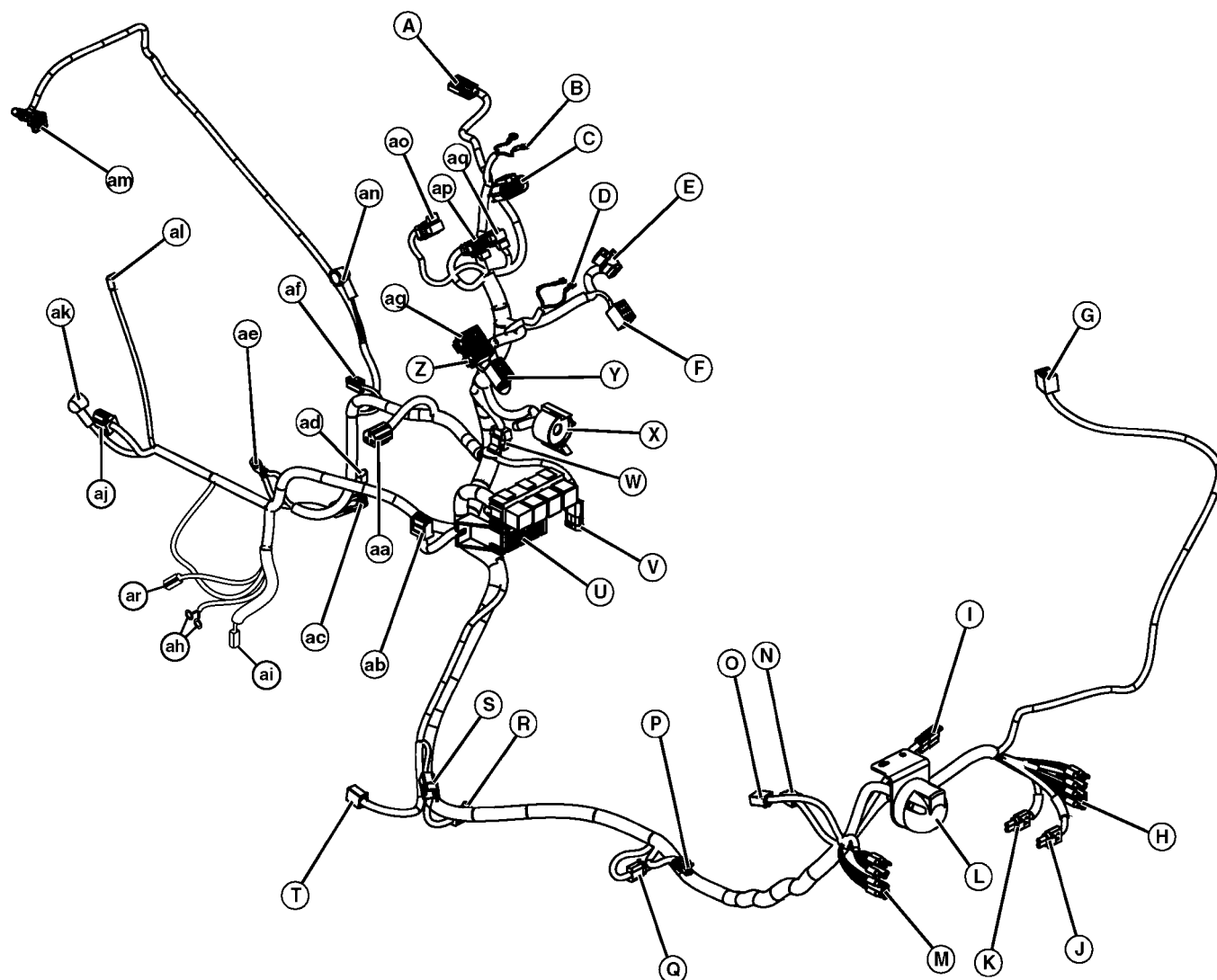
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KN52281,1004362 -19-14DEC12-3/4

Size/No./Color	Wire Connection Points
0.8 777A Pur	X6, S7
1.0 903B Org	H1, X3
0.8 908 Gry	S5, X7
0.8 924A Yel	X5, X7
0.8 925A Grn	X5, X7

KN52281,1004362 -19-14DEC12-4/4

W1 Main Wiring Harness Component Location—MY13

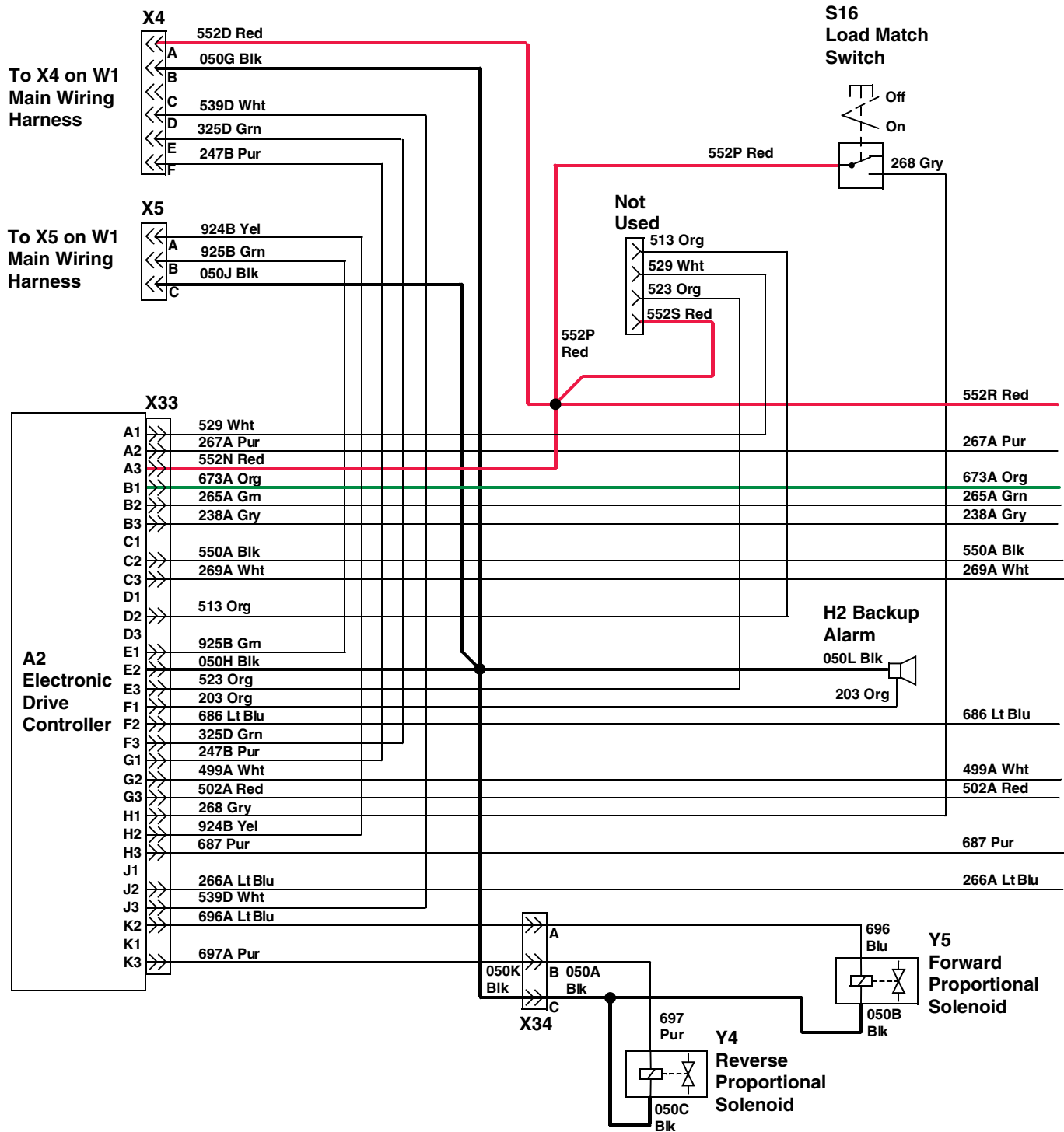


Main Wiring Harness Component Location

A—X3 Connector to W2 Headlight/Horn Wiring Harness	L—X13 Trailer Connector	W—X4 Connector to W9 Wiring Harness	AJ—G2 Alternator
B—B4 Fuel Gauge Sensor	M—LH Tail/Hazard Light Connectors to W7 Left Rear Lights Wiring Harness	X—S2 Key Switch Connector	AK—G2 Alternator Battery +
C—X6 to A1 Display Panel	N—S12 Park Brake Switch	Y—S13 Hazard Lights Switch	AL—B3 Engine Coolant temperature Sensor
D—S1 Horn Switch	O—S8 Seat Switch	Z—S14 Turn Signal Switch	AM—B1 Air Restriction Switch
E—S3 Light Switch	P—Y3 PTO Solenoid	AA—Y2 Fuel Shutoff Solenoid	AN—R1 Manifold Heater
F—S21 Front PTO Switch	Q—S10 MFWD Engagement Sensing Switch	AB—K5 Trailer Relay	AO—X11 Connector to A1 Display Panel
G—S4 Rear PTO Switch	R—S11 Transmission Neutral Switch (PRT) or W4 Jumper Plug	AC—Y6 Front PTO Clutch Switch	AP—X10 Connector to A1 Display Panel
H—RH Tail/Hazard Light Connectors to W8 Right Rear Lights Wiring Harness	S—(not used)	AD—B2 Engine Oil Pressure Switch	AQ—X6 Connector to A1 Display Panel
I—X25 License Plate Light Connector	T—S15 Brake Switch	AE—W1 Battery/Frame Ground	AR—X57 Front Implement Detector
J—S7 Rear (540) PTO Sensing Switch	U—Load Center	AF—M2 Fuel Pump	
K—S9 Mid PTO Switch (optional)	V—X5 Diagnostic Interface Connector or to W9 Wiring Harness	AG—S5 Display Mode Switch	
		AH—Y1 Starting Motor Solenoid Battery +	
		AI—Y1 Starting Motor Solenoid	

LVAL38857—UN—07DEC12

KN52281,1004364 -19-10JAN13-1/1

W9 eHydro™ and Cruise Control Electrical Schematic—MY13**W9 eHydro™ and Cruise Control Electrical Schematic (1 of 2)**

LVAL11925—UN—12NOV10

Continued on next page

KN52281,1004365 -19-11JAN13-1/4

A2—Electronic Drive Controller
H2—Backup Alarm
S16— Load Match Switch
W1—Main Wiring Harness

X4— W1 Main Wiring Harness to
W9 Wiring Harness
X5— W1 Main Wiring Harness to
W9 Wiring Harness

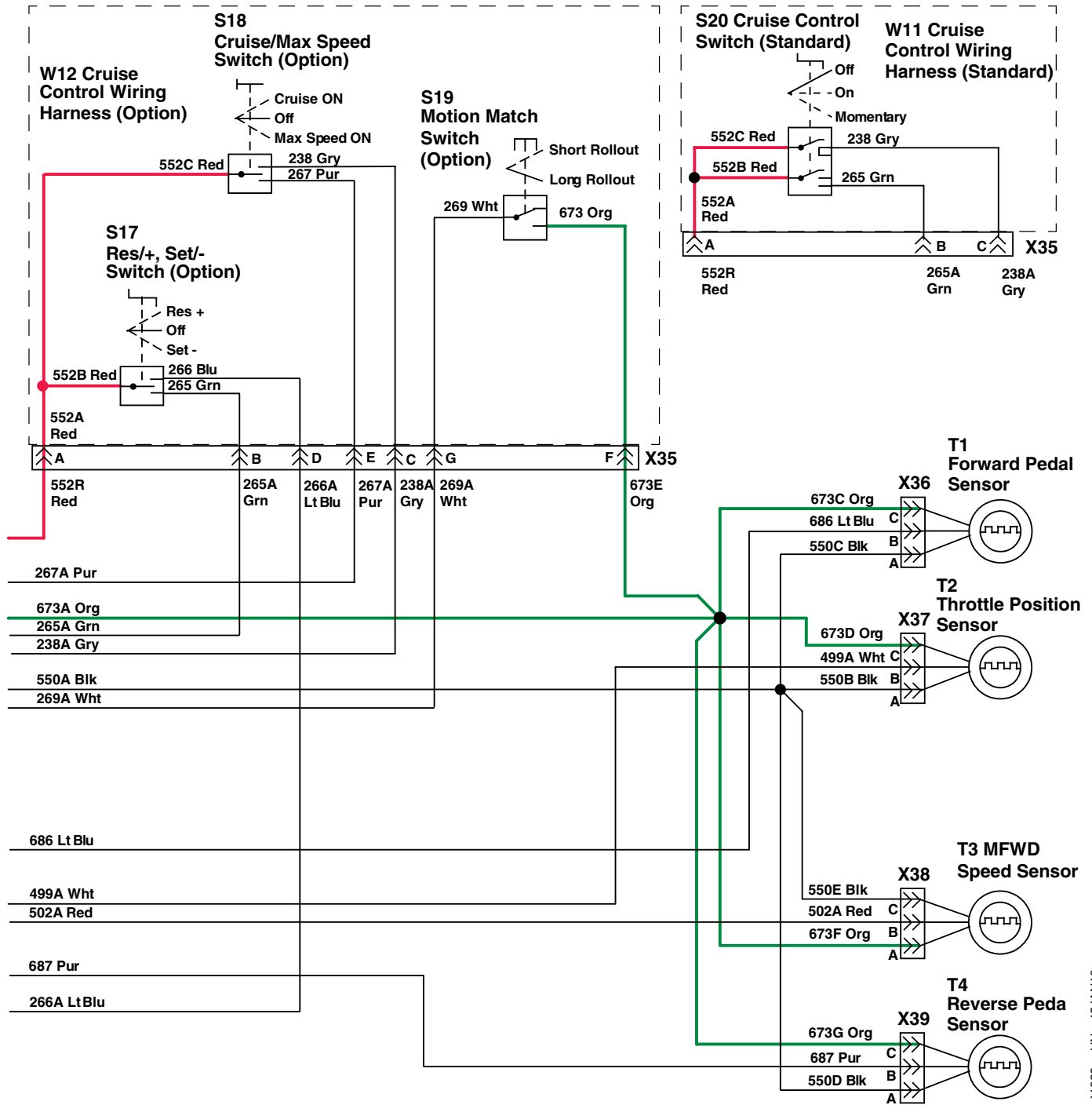
X33— W9 Wiring Harness to A2
Electronic Drive Controller
X34— W9 Wiring Harness to W10
Proportional Valve Wiring
Harness

Y4—Reverse Proportional
Solenoid
Y5—Forward Proportional
Solenoid

Continued on next page

KN52281,1004365 -19-11JAN13-2/4

W9 eHydro™ and Cruise Control Electrical Schematic (2 of 2)



Cruise Control Electrical Schematic

LVAL11926—UN—15JAN13

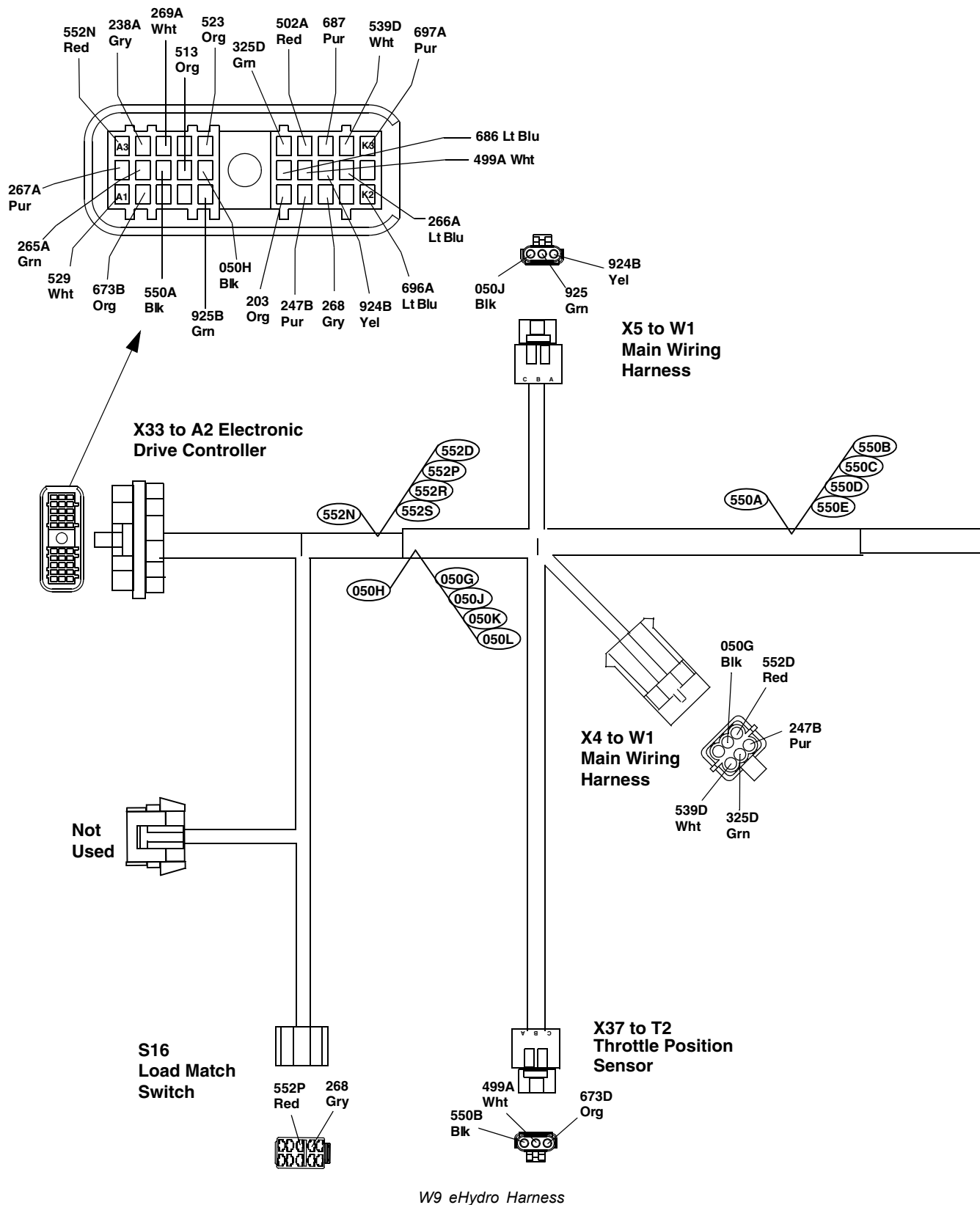
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KN52281,1004365 -19-11JAN13-3/4

S17— Res/+, Set/- Switch (optional)	T3— MFWD Speed Sensor	X35— W9 Wiring Harness to W12 Cruise Control Wiring Harness (optional)	X38— W9 Wiring Harness to T3 MFWD Speed Sensor
S18— Cruise/Max Speed Switch (optional)	T4— Reverse pedal Sensor	X36— W9 Wiring Harness to T1 Forward Pedal Sensor	X39— W9 Wiring Harness to T4 Reverse Pedal Sensor
S19— Motion Match Switch (optional)	W11— Cruise Control Wiring Harness (standard)	X37— W9 Wiring Harness to T2 Throttle Position Sensor	
S20— Cruise Switch (standard)	W12—Cruise Control Wiring harness (optional)		
T1— Forward Pedal Sensor	X35— W9 Wiring Harness to W11 Cruise Control Wiring Harness (standard)		
T2— Throttle Position Sensor			

KN52281,1004365 -19-11JAN13-4/4

W9 eHydro™ Harness—MY13



LVAL40760 —UN—11DEC12

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KN52281,1004366 -19-10JAN13-1/3

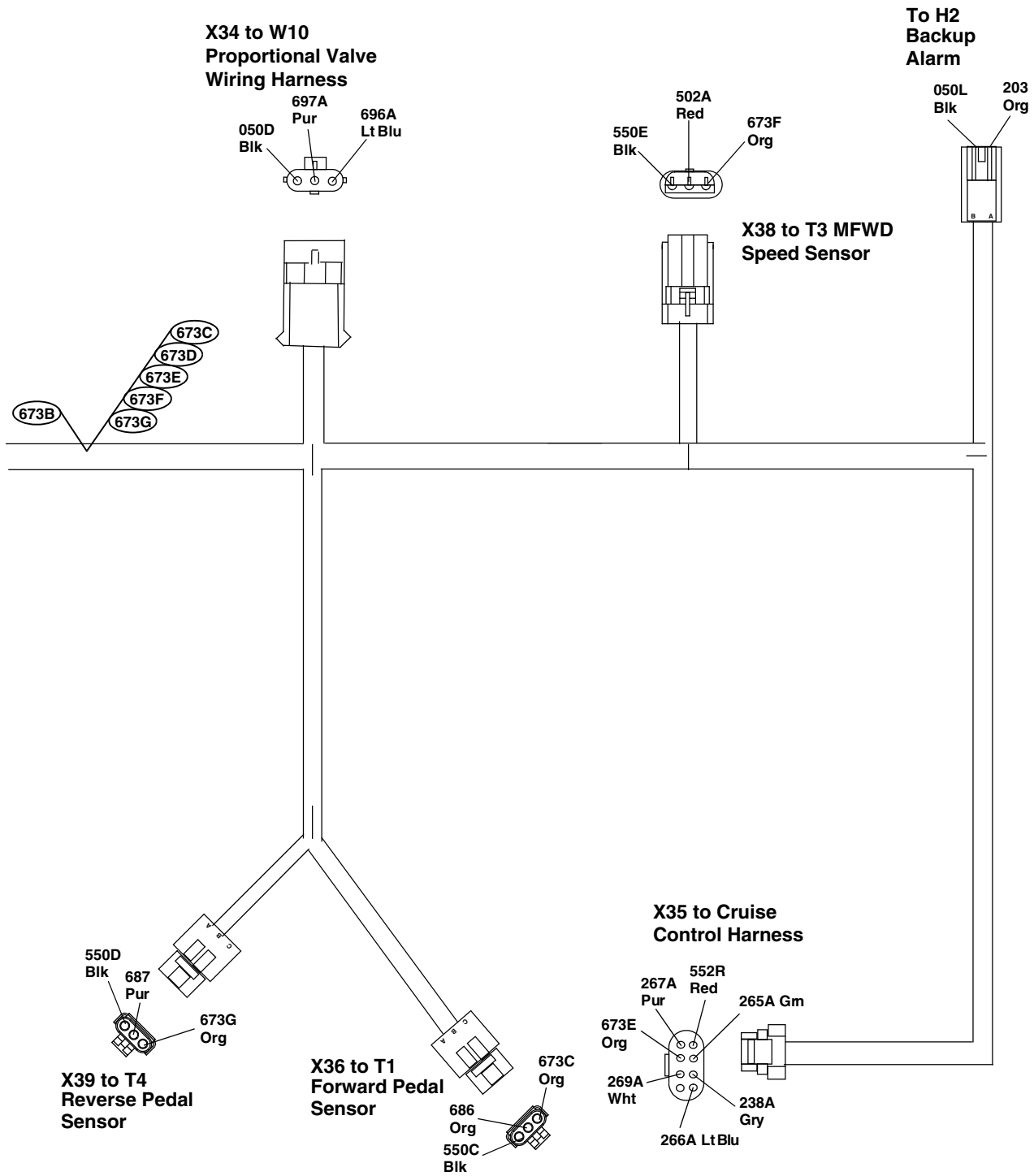
A2—Electronic Drive Controller
S16— Load Match Switch
T2— Throttle Position Sensor

W1—Main Wiring Harness
X4— W1 Main Wiring Harness to
W9 Wiring Harness
X5— W1 Main Wiring Harness to
W9 Wiring Harness

X33— W9 Wiring Harness to A2
Electronic Drive Controller
X37— W9 Wiring Harness to T2
Throttle Position Sensor

Continued on next page

KN52281,1004366 -19-10JAN13-2/3



W9 eHydro Harness

H2—Backup Alarm
T1—Forward Pedal Sensor
T3—MFWD Speed Sensor
T4—Reverse Pedal Sensor
X34—W9 Wiring Harness to W10 Proportional Valve Wiring Harness

X35—W9 Wiring Harness to W11 Cruise Control Wiring Harness (standard)
X36—W9 Wiring Harness to T1 Forward Pedal Sensor

X38—W9 Wiring Harness to T3 MFWD Speed Sensor
X39—W9 Wiring Harness to T4 Reverse Pedal Sensor

LVAL11928—UN—15JAN13

KN52281,1004366 -19-10JAN13-3/3

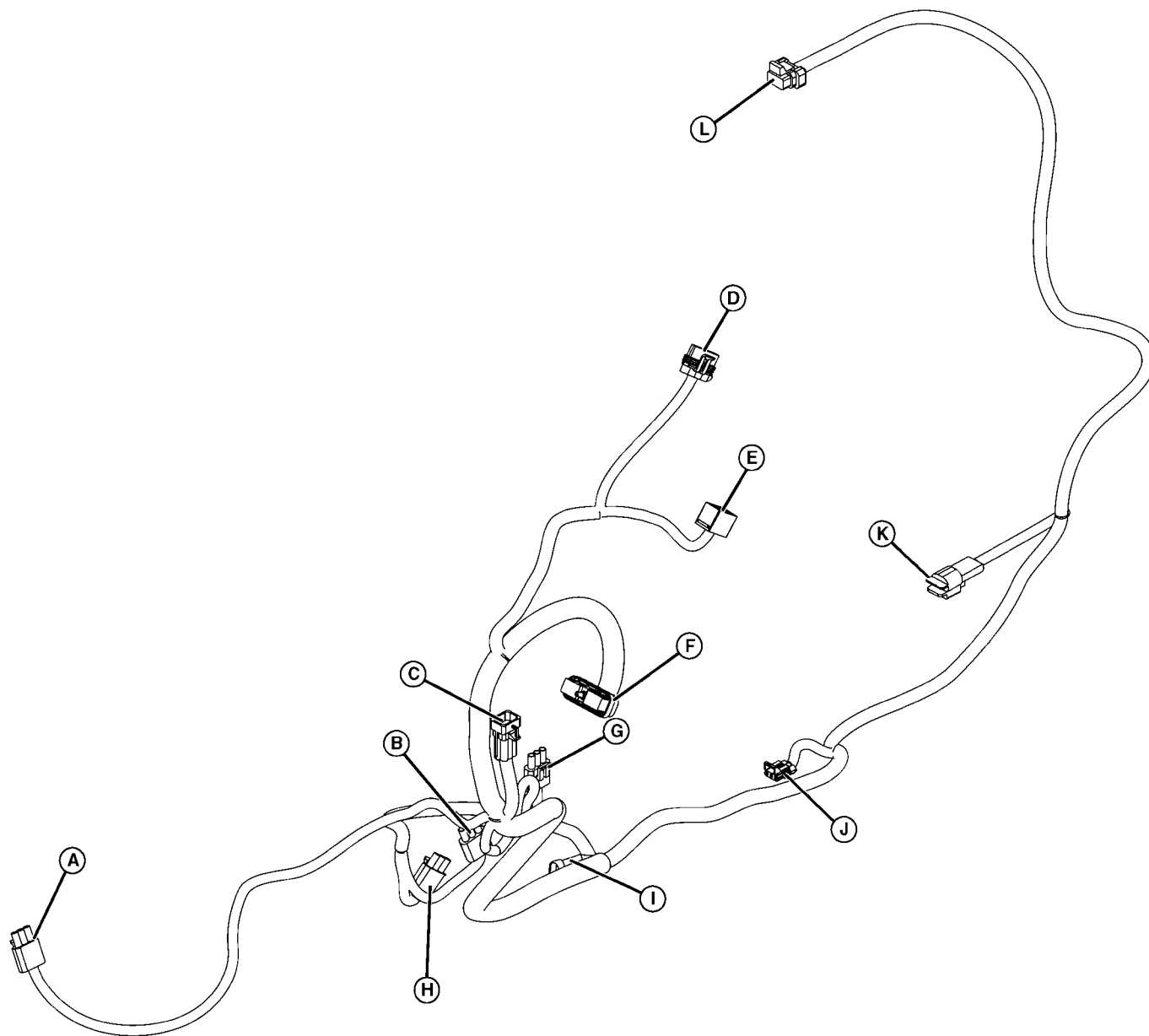
W9 eHydro™/AutoHST Wiring Harness Color Codes—MY13

Size/No./Color	Wire Connection Points
0.8 050G Blk	Splice 050, X4
0.8 050H Blk	X26, Splice 050
0.8 050J Blk	Splice 050, X5
0.8 050K Blk	Splice 050, X34
0.8 050L Blk	Splice 050, H2
0.8 203 Org	X33, H2
0.8 238A Gry	X33, X35
0.8 247B Pur	X33, X4
0.8 265A Grn	X33, X35
0.8 266A Lt Blu	X33, X35
0.8 267A Pur	X33, X35
0.8 268 Gry	X33, S16
0.8 269A Wht	X33, X35
0.8 325D Grn	X33, X4
0.8 499A Wht	X33, T2
0.8 502A Red	X33, T3
0.8 513 Org	X33, S18
0.8 523 Org	X33, S18
0.8 529 Wht	X33, S18
0.8 539D Wht	X4, X33
0.8 550A Blk	X33, Splice 550
0.8 550B Blk	Splice 550, T2
0.8 550C Blk	Splice 550, T1
0.8 550D Blk	Splice 550, T4
0.8 550E Blk	Splice 550, T3
0.8 552D Red	Splice 552, X4
0.8 552N Red	X33, Splice 552
0.8 552P Red	Splice 552, S16
0.8 552R Red	Splice 552, X35
0.8 552S Red	Splice 552, S18
0.8 673B Org	X33, Splice 673
0.8 673C Org	Splice 673, T1
0.8 673D Org	Splice 673, T2
0.8 673E Org	Splice 673, X35
0.8 673F Org	Splice 673, T3
0.8 673G Org	Splice 673, T4
0.8 686 Lt Blu	X33, T1
0.8 687 Pur	X33, T4
0.8 696A Lt Blu	X33, X34
0.8 697A Pur	X33, X34
0.8 924B Yel	X33, X5
0.8 925B Grn	X33, X5

Wiring Harness Color Codes

KN52281,1004367 -19-14DEC12-1/1

W9 eHydro™/AutoHST Wiring Harness—MY13



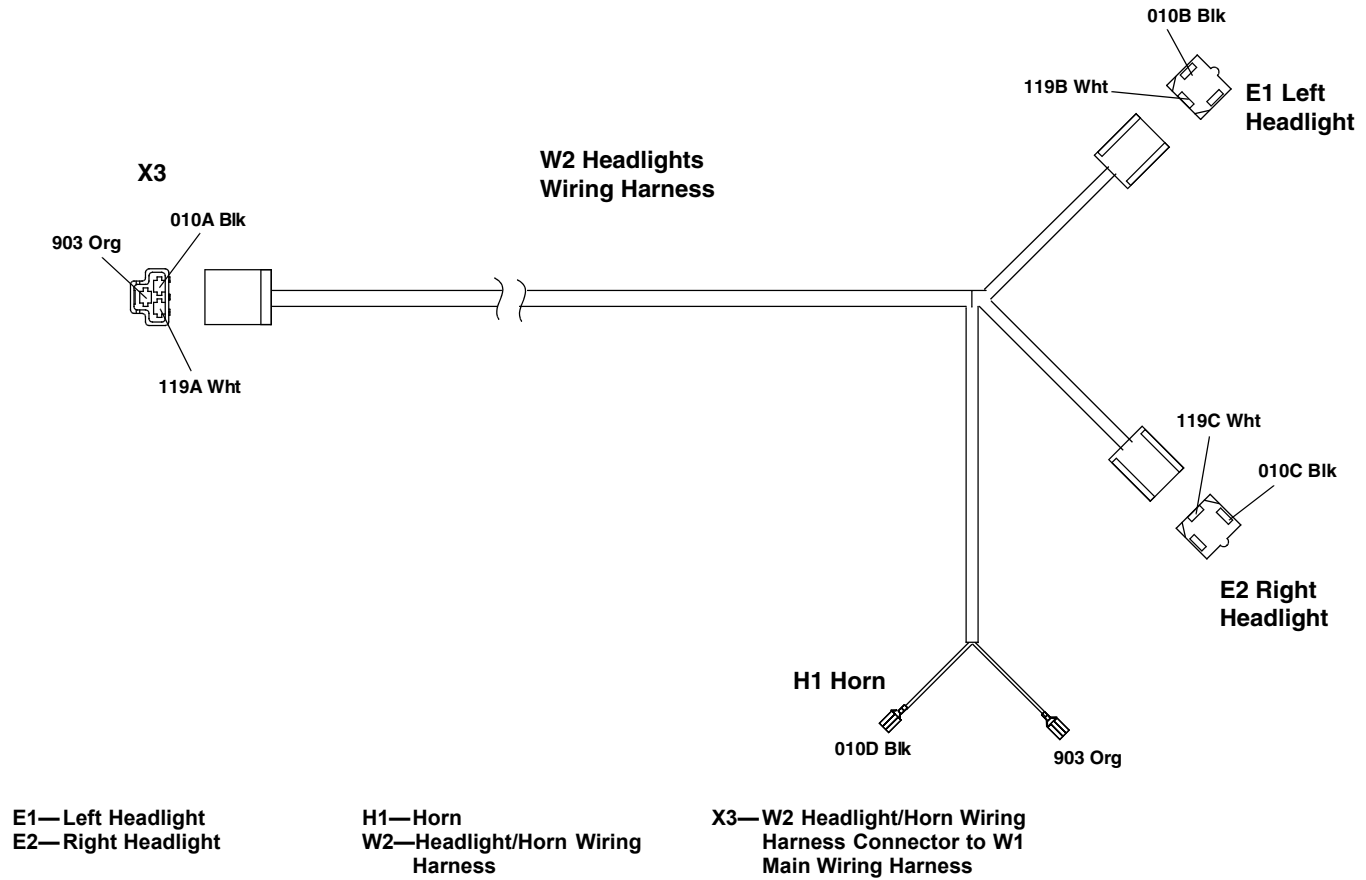
Left Front View

- | | | |
|--|--|---|
| A—T2 Throttle Position Sensor | E—S16 Load Match Switch | I—X34 Connector to W10 Valve Wiring Harness |
| B—T1 Forward Pedal Sensor | F—X33 to A2 Electronic Drive Controller | J—T3 MFWD Speed Sensor |
| C—X4 Connector to W1 Main Wiring Harness | G—T4 Reverse Pedal Sensor | K—H2 Back Up Alarm |
| D—S18 Cruise Control Switch (optional) | H—X5 Connector to W1 Main Wiring Harness | L—X35 Connector to W11 (standard) or W12 (optional) Cruise Control Wiring Harness |

KN52281,1004368 -19-10JAN13-1/1

LVAL11928 —UN—12NOV10

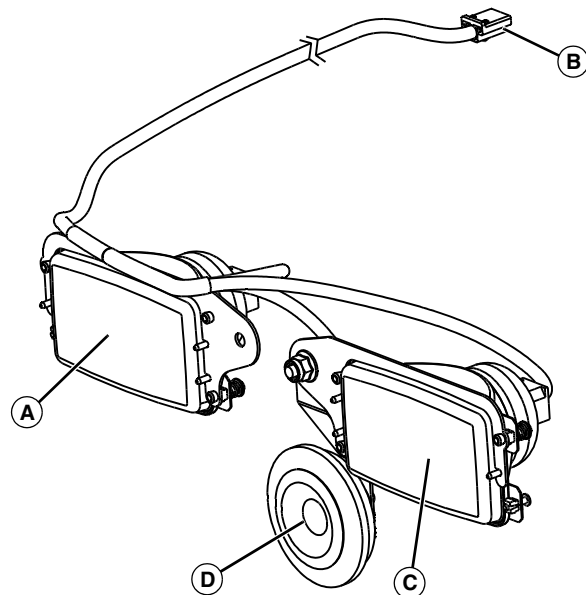
W2 Headlight/Horn Wiring Harness



LVAL11930—UN—15JAN13

KN52281,1004369 -19-10JAN13-1/2

A—E2 Right Headlight
B—X3 Connector
C—E1 Left Headlight
D—H1 Horn



LVAL11931—UN—12NOV10

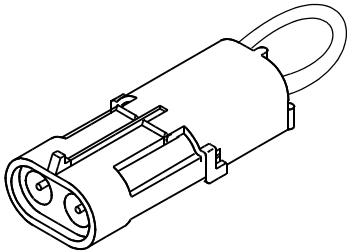
KN52281,1004369 -19-10JAN13-2/2

W2 Headlight/Horn Wiring Harness Color Codes

Size/No./Color	Wire Connection Points
1.3 010A Blk	X3, Splice
1.3 010B Blk	Splice, E1
1.3 010C Blk	Splice, E2
1.3 010D Blk	Splice, H1
1.3 119A Wht	X3, Splice
1.3 119B Wht	Splice, E1
1.3 119C Wht	Splice, E2
1.3 903 Org	X3, H1

KN52281,100436A -19-23OCT12-1/1

W3 and W4 Jumper Plug



W3 and W4 Jumper Plug

KN52281,100436B -19-23OCT12-1/1

LVAL11932 —UN—18NOV10

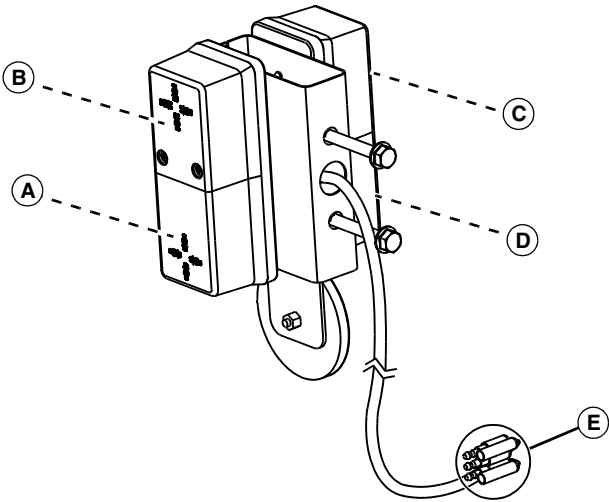
W7 Left Rear Lights Wiring Harness

- A—E13 Left Rear Turn/Hazard Light

B—E14/E15 Left Marker/Brake Light

C—E12 Left Front Marker Light
- D—E11 Left Front Turn/Hazard Light

E—X26, X27, X28, X29, X30, X31 and X32 Connectors



KN52281,100436C -19-10JAN13-1/1

LVAL11933 —UN—12NOV10

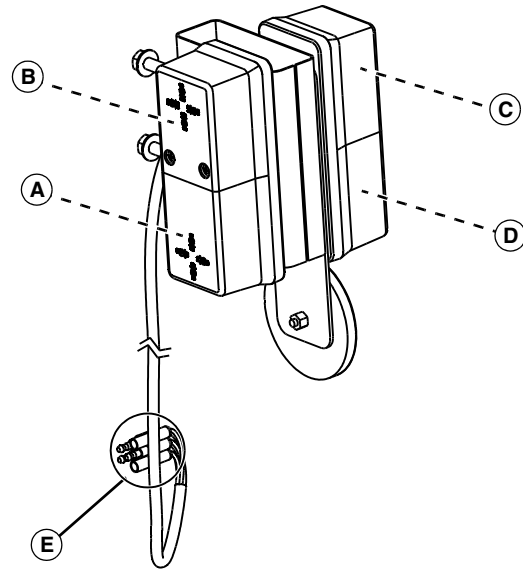
W7 Left Rear Lights Wiring Harness Color Codes

Size/No./Color	Wire Connection Points
1.0 Grn	X26, E11
1.0 Gry	X27, E12
1.0 Blk	X28, E11 and E12
1.0 Grn	X29, E13
1.0 Gry	X30, E14
1.0 Blu	X31, E15
1.0 Blk	X32, E13, E14 and E15

KN52281,100436D -19-23OCT12-1/1

W8 Right Rear Lights Wiring Harness

- A**—E7 Right Rear Turn/Hazard Light
B—E8/E9 Right Marker/Brake Light
C—E6 Right Front Marker Light
D—E5 Right Front Turn/Hazard Light
E—X18, X19, X20, X21, X22, X23 and X24 Connector



LVAL11934—UN—12NOV10

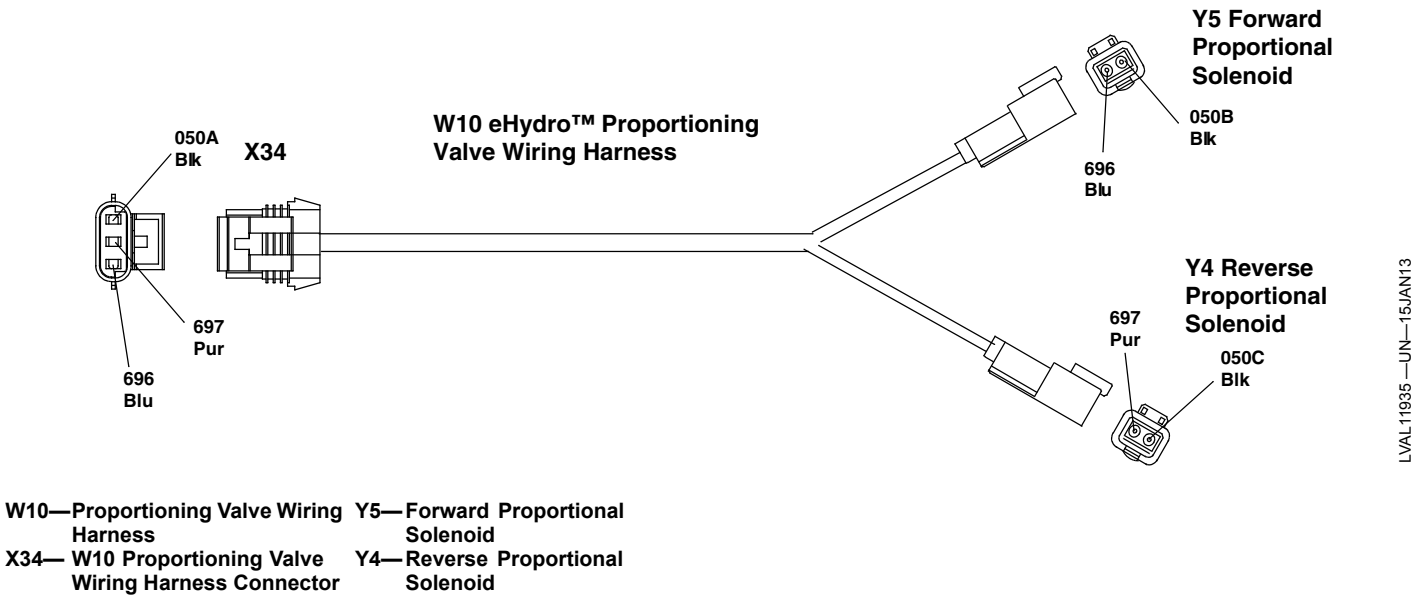
KN52281,100436E -19-10JAN13-1/1

W8 Right Rear Lights Wiring Harness Color Codes

Size/No./Color	Wire Connection Points
1.0 Grn	X18, E5
1.0 Gry	X19, E6
1.0 Blk	X20, E5 and E6
1.0 Grn	X21, E7
1.0 Gry	X22, E8
1.0 Blu	X23, E9
1.0 Blk	X24, E7, E8 and E

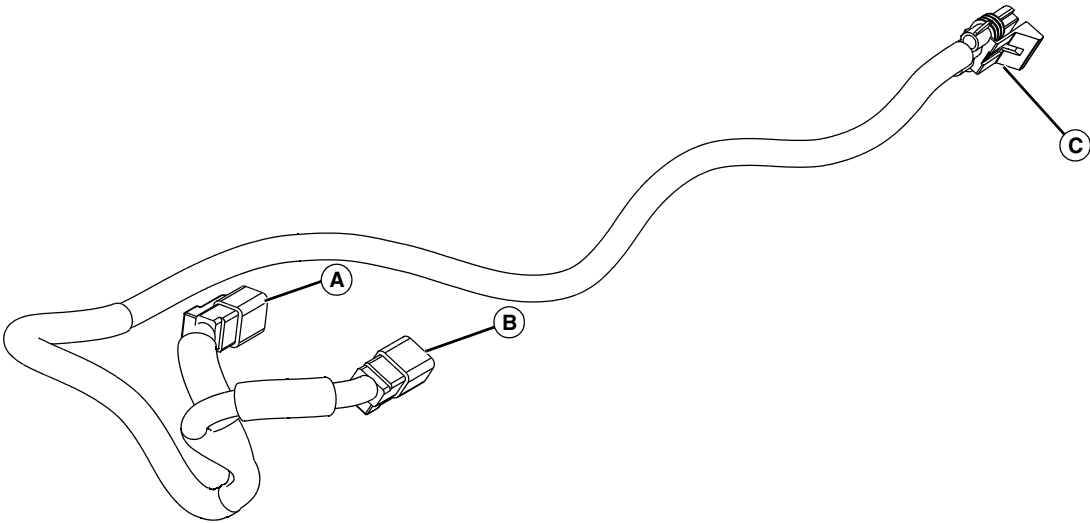
KN52281,100436F -19-23OCT12-1/1

W10 Proportional Valve Wiring Harness



LVAL11935—UN—15JAN13

KN52281,1004370 -19-10JAN13-1/2



A—Y5 Forward Proportional Solenoid
B—Y4 Reverse Proportional Solenoid
C—X34 Connector

LVAL11936—UN—12NOV10

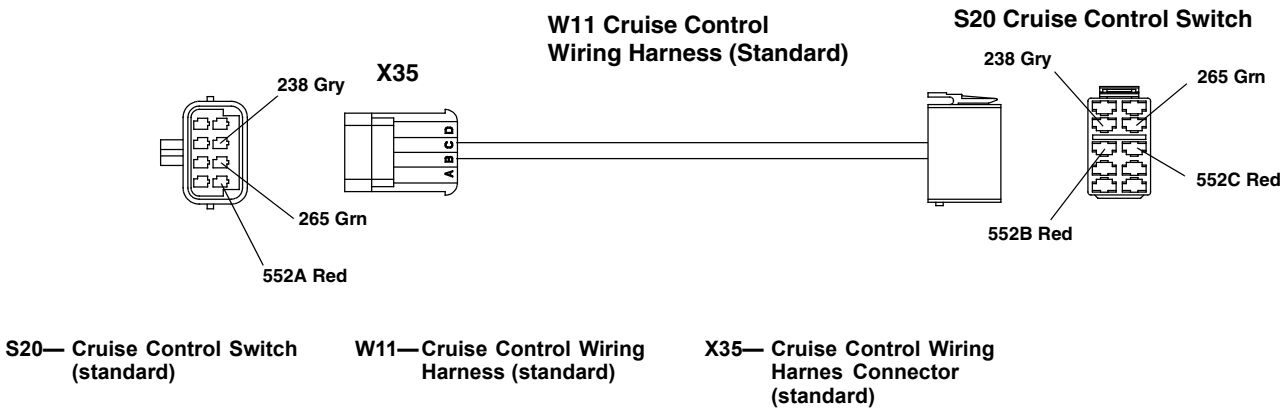
KN52281,1004370 -19-10JAN13-2/2

W10 Proportional Valve Wiring Harness
Color Codes

Size/No./Color	Wire Connection Points
1.0 050A Blk	X34, Splice
1.0 050B Blk	Splice, Y5
1.0 050C Blk	Splice, Y4
1.0 696 Blu	X34, Y5
1.0 697 Pur	X34, Y4

KN52281,1004371 -19-23OCT12-1/1

W11 Cruise Control Wiring Harness (Standard)

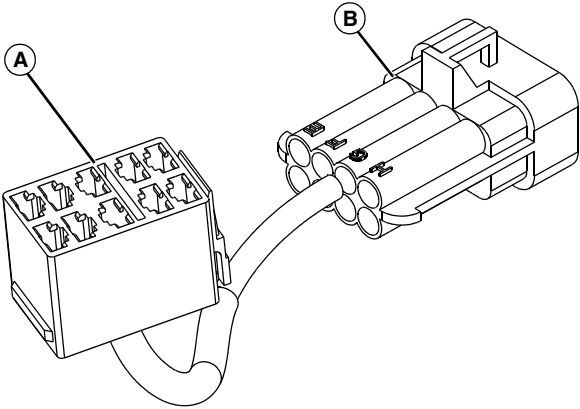


LVAL11937 —UN—15JAN13

KN52281,1004372 -19-10JAN13-1/2

A—S20 Cruise Control Switch (standard)

B—X35 Cruise Control Wiring Harness Connector (standard)



LVAL11938 —UN—12NOV10

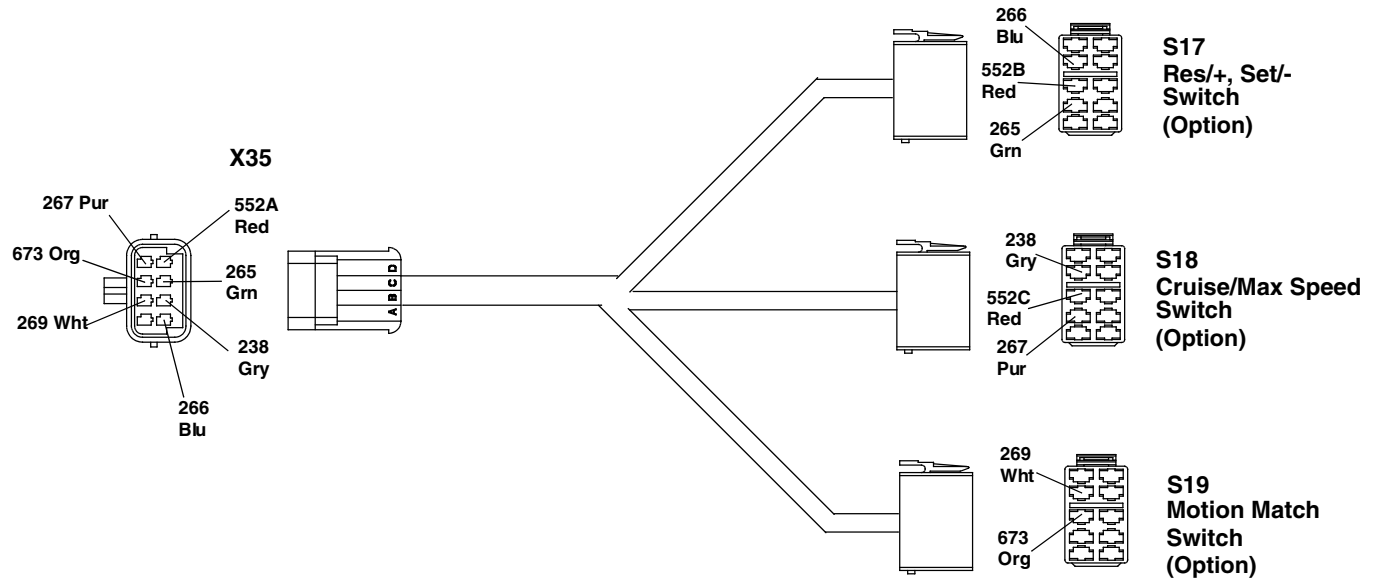
KN52281,1004372 -19-10JAN13-2/2

W11 eHydro™ Cruise Control Wiring Harness Color Codes (Standard)

Size/No./Color	Wire Connection Points
0.8 238 Gry	X35, S20
0.8 265 Grn	X35, S20
0.8 562A Red	X35, Splice
0.8 562B Red	Splice, S20
0.8 562C Red	Splice, S20

KN52281,1004373 -19-23OCT12-1/1

W12 Cruise Control Wiring Harness (Optional)



S17— Cruise/Max Speed Switch

S18— Res/+ Set/- Switch

S19— Motion Match Switch

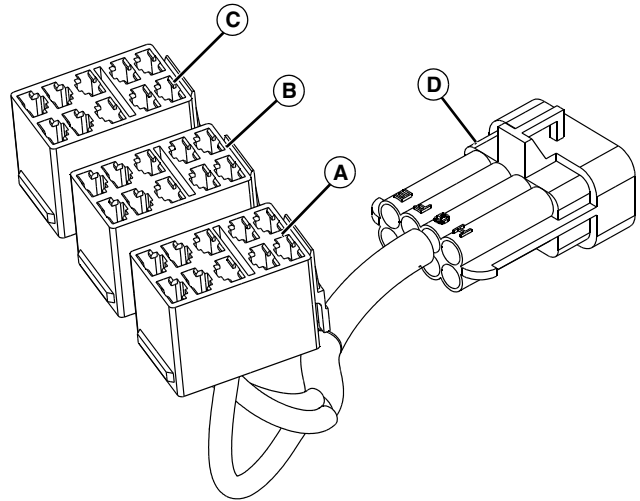
X35— Connector

KN52281,1004374 -19-10JAN13-1/2

LVAL11939 —UN—15JAN13

A—S17 Res/+ Set/- Switch
(optional)
B—S18 Cruise/Max Speed
Switch (optional)

C—S19 Motion Match Switch
(optional)
D—X35 Connector



KN52281,1004374 -19-10JAN13-2/2

LVAL11940 —UN—12NOV10

**W12 eHydro™ Cruise Control Wiring Harness
Color Codes (Optional)**

Size/No./Color	Wire Connection Points
0.8 238 Gry	X35, S18
0.8 265 Grn	X35, S17
0.8 266 Blu	X35, S17
0.8 267 Pur	X35, S18
0.8 269 Wht	X35, S15
0.8 562A Red	X35, Splice
0.8 562B Red	Splice, S17
0.8 562C Red	Splice, S18
0.8 673 Org	X35, S15

KN52281,1004375 -19-23OCT12-1/1

Display Panel Fault Codes

Purpose:

To provide the operator and the technician with information that will aid in the diagnosis of operational problems that may occur.

Operation:

During normal operation the display panel will show the hours of operation on the engine.

A fault code will be displayed when an operational command input is supplied to the display panel or the electronic drive controller on eHydro™ machines, and any one or more parts of that circuit output are not operating properly.

The fault code will be displayed that will help identify the problem. If more than one fault exists the lowest number

code will be displayed. When that fault is corrected, the next fault code in numerical sequence will be displayed. Each fault will have to be corrected and clear one by one should there be multiple faults.

Once a code has been displayed, it can be matched to the fault code chart to explain what the display panel logic is reading as a problem, and what corrective action is needed to positively identify and correct the source of the fault.

NOTE: When taking the required action to correct a fault, use the built-in diagnostics of the display panel.

Fault codes 01 through 15 are associated to the eHydro™ drive control operation. Fault codes 50 through 77 are associated to the display functions.

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KN52281,1004376 -19-23OCT12-1/1

Display Panel Fault Code Chart

Display Value	Description	Cause of Fault	Result of Fault	Required Action
Err 01	Forward and Reverse Pedals	Both the pedals are depressed.	Machine does not drive.	Release both the pedals and depress one at a time.
Err 02	Forward Pedal	Voltage signal out-of-range or not calibrated.	Machine does not drive.	Calibrate the sensor. (See eHydro™/Auto HST—Single Sensor Calibration in Section 40, Group 45.) Check the sensor and 686 Lt Blu wire and connections.
Err 03	Reverse Pedal	Voltage signal out-of-range or not calibrated.	Machine does not drive.	Calibrate the sensor. (See eHydro™/Auto HST—Single Sensor Calibration in Section 40, Group 45.) Check the sensor and 687 Pur wire and connections.
Err 04	Engine Speed	No signal at Engine Speed input.	No anti-stall or cruise functions; Loss of performance.	Check the 325A, 325B, and 325C Grn wires and connections for short or open circuit.
Err 05	Brake and Cruise Set/Decel Switch	Cruise control Set/Decel switch depressed while brake is engaged.	No cruise function.	Release brake pedal. Adjust or repair brake switch. Check 247 Pur wire and connections for short or open circuit.
Err 06	MFWD Speed	No signal at MFWD speed input.	No cruise function; Loss of performance.	Test MFWD sensor. Check that MFWD is fully engaged. Check 502 Red wire and connections for short or open circuit.
Err 07	Cruise Set/Decel Switch	Cruise Set/Decel switch is held or stuck on.	No cruise function.	Check 238 Gry and 265 Grn wires and connections for short circuit to battery voltage. Test the cruise set/dec el switch.
Err 08	Throttle Sensor	Voltage signal out-of-range or not calibrated.	No anti-stall function; Loss of performance.	Calibrate the sensor. (See eHydro™/Auto HST—Single Sensor Calibration in Section 40, Group 45.) Check the sensor and 499 Wht wire and connections.
Err 09	Cruise On/Off and Set Max Speed switches	Cruise and Max Speed inputs are both active	No cruise function	Test the cruise/max speed switch. Check 238 Gry and 267 Pur wires and connections for short circuit to battery voltage.
Err 10	No application	NA	Machine does not drive.	Program the eHydro™ controller with the latest application software.
Err 11	Cruise Set/Decel and Cruise Res/Accel switches	Set/Decel and Resume/Accel switches are both active.	No cruise function.	Test the cruise res/+, set/- switch. Check the 266 Blu and 265 Grn wires and connections for short circuit to battery voltage.
Err 12	Sensor Supply voltage	Voltage is out-of-range.	Machine does not drive.	Check the 673 series of wires and connections for a short or open circuit.
Err 13	No application	NA	Machine does not drive.	Program the eHydro™ controller with the latest application software.

Continued on next page

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Troubleshooting

Display Value	Description	Cause of Fault	Result of Fault	Required Action
Err 14	Pump Current	Coil resistance too high (open) or too low (short).	Machine does not drive.	Test the proportional valve coils. Check 696 Blu and 697 Pur wires and connections for short or open circuit.
Err 15	Operator Present	Operator not in the seat.	Machine does not drive.	Test seat switch. Check 539C, 539B, and 539A Wht wires and connections for open circuit.
Err 50	EOL Faults Size	Fault Table size is not compatible with the Application.	Display and eHydro™ Error Codes might not be displayed.	Update the display to the latest application and configuration data.
Err 51	EOL EEPROM Size	EEPROM Default Parameter table size is not compatible with the Application.	Default configuration settings could be incorrect.	Update the display to the latest application and configuration data.
Err 52	eHydro™ Faults Size	eHydro™ fault list does not match Display fault list.	eHydro™ Error Codes might not displayed.	Update the display to the latest application and configuration data.
Err 53	EOL Major Version	EOL Data structure is incompatible with application.	Loss of performance.	Update the display to the latest application and configuration data.
Err 54	EOL Minor Version	EEPROM Data is updated.	EEPROM Data Level 1 and 2 are reset to EOL Data.	Turn the key switch OFF, wait 3-4 seconds and turn back ON. If error continues, update to the latest software.
Err 55	EEPROM Checksum	EEPROM failure the value have been to defaults, resets the hour meter.	EEPROM Data is reset to EOL Data, Resets the hour meter.	Turn the key switch OFF, wait 3-4 seconds and turn back ON. If error continues, update to the latest software.
Err 56	eHydro™ Unable to Send	Critical eHydro™ messages are missing.	Loss of features.	Check the communication harness between the display and eHydro™ controller. Connectors X5 and X4, wires 924 Yel and 925 Grn.
Err 57	eHydro™ Timeout	No response from eHydro™ controller.	Loss of features.	Check the communication harness between the display and eHydro™ controller. Connectors X5 and X4, wires 924 Yel and 925 Grn.
Err 58	eHydro™ Compatibility	eHydro™ communication structure is not compatible with Display communication structure.	Loss of features.	Update the display to the latest application and configuration data. If the error continues, update the eHydro™ controller with the latest application software.
Err 59	VIN not same	eHydro™ VIN does not match the Display VIN.	eHydro™ or Display is programmed with wrong VIN.	Check and update the VIN in both the display and the eHydro™ controller.
Err 68	Pull-In Relay ON	Output from the display is short circuit.	No fuel to the engine	Check the pull-in coil relay. Check the harness for short circuit to ground.
Err 69	Pull-in Relay OFF	Output from display is open.	No fuel to the engine.	Check the pull-in coil relay. Check the harness for short circuit to battery or open circuit.
Err 70	Hold Coil On	Output from the display is short circuit		Check in Hold-in coil. Check the 302 Red wire for short to ground. (See Fuel Supply/Engine Shutoff Circuit Operation.)

Continued on next page

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Display Value	Description	Cause of Fault	Result of Fault	Required Action
Err 71	Hold Coil Off	Output from the display is open..	No fuel to the engine.	Check in Hold-in coil. Check the 302 Red wire for short to battery voltage or open circuit. (See Fuel Supply/Engine Shutoff Circuit Operation .)
Err 72	Starter Relay ON	Output from the Display is short circuit.	Can not crank the engine.	Check the start relay. Check the 518 Gry wire for short to ground. (See Cranking Circuit Operation in Section 50, Group 35.)
Err 73	Starter Relay OFF	Output from the Display is open.	Can not crank the engine.	Check the start relay. Check the 518 Gry wire for short to battery voltage or open circuit. (See Cranking Circuit Operation in Section 50, Group 35.)
Err 74	Display Mode Switch	The LCD Display Mode/Configuration input is stuck on.	No acknowledgement of errors. No other info selectable. No eHydro™ commands selectable.	Test the display mode switch. Check 908 Gry wire and connections. (See Display Mode Switch Circuit Operation in Section 50, Group 35.)
Err 75	Invalid VIN	Invalid VIN or VIN has not been programmed	Display could be programmed with wrong VIN	Check and update the VIN in both the display and the eHydro™ controller.
Err 76	VIN Type	VIN type does not match the unit type	Display could be programmed with wrong chassis type	Update the display to the latest application and configuration data. Update VIN in the display.
Err 77	EOL VIN Type	EOL VIN type does not match the chassis type	Display could be programmed with wrong chassis type	Update the display to the latest application and configuration data. Update VIN in the display.
Err 87	RIO Switch Stuck ON	Reverse implement option switch is stuck on.	No PTO function.	Replace switch.
Err 88	Bad Intelligent Device or Component	ICC not programmed or programmed incorrectly.	No RIO switch fuction.	Contact John Deere dealer.
Err 89	PTO Solenoid Open Circuit	PTO coil current too low or Open circuit.	PTO solenoid will not function.	Contact John Deere dealer.

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Power Circuit Operation

Model Year 2007 Serial Number Breaks (Pre MY08)

Model	Transmission	Serial Number
3320	eHydro™	-435000
3320	PRT	-440000
3520	eHydro™	-470000
3520	PRT	-475000

Model Year 2008 Serial Number Breaks (MY08)

Model	Transmission	Serial Number
3320	eHydro™	435001-
3320	PRT	440001-
3520	eHydro™	470001-
3520	PRT	475001-
3720	eHydro™	492001-

Function:

To provide unswitched and switched power to the primary electrical components whenever the battery is properly connected.

The power circuits are divided among the unswitched power circuit, switched power circuits (key switch in run position), and secondary power circuits. The secondary power circuits become energized when switched power circuits energize relays and/or control modules, providing current paths to the secondary circuits. The secondary power circuits will not be energized if the relay or control module controlling the current path(s) fail.

Unswitched Power:

Voltage must be present at each of the following components with the key switch in the off position:

- G1 Battery positive terminal
- Y1 Starting motor solenoid B terminal
- G2 Alternator terminal B
- F3, F4, F5, and F6 Fuses
- S2 Key Switch terminal 1
- K1 Fuel Relay terminal 30
- K3 Manifold Heater Relay terminal 30
- K4 Trailer Relay terminal 30 (Pre MY08)
- K4 Lights Relay terminal 87(MY08/MY13)
- K5 Trailer Relay terminal 30 (MY08/MY13)
- K6 Brake Light Relay terminal 30
- S3 Light Switch terminal B
- S1 Horn Switch terminal 2
- A1 Display Panel X10 Connector terminals D and H
- S13 Hazard Lights Switch terminal 3
- S15 Brake Switch terminal A

The positive battery cable connects the battery to the starting motor. The starting motor bolt is used as the 12 Volt DC tie point for the rest of the electrical system.

The battery cables and the starting motor tie point connections must be good for the machine electrical system to work properly. The ground cable and positive

cable connections are equally important. Proper starting motor operation depends on these cables and connections to carry high current.

With the exception of the B terminal of the alternator, the electrical circuit is protected by either the F1 or F2 fusible link beyond the starting motor tie point. The fusible link is a short piece of wire that is designed to fail if current load is too high or a short occurs.

Switched Power:

In addition to the voltage present at the locations of the unswitched power circuits, voltage must be present at the following components during the following conditions: key switch in the run position, transmission in neutral, PTO(s) off, brakes off, park brake locked, MFWD disengaged, and operator off seat:

- S2 Key Switch terminals 3 and 5
- G2 Alternator terminal IG
- G2 Alternator 072A Red wire
- F7 and F11 Fuses
- K4 Trailer Relay terminal 86 (Pre MY08)
- K5 Trailer Relay terminal 86 (MY08/MY13)
- S13 Hazard Lights Switch terminals 1 and 2
- X4 Connector terminals A and D (Pre MY08)
- X4 Connector terminals A and F (MY08/MY13)
- X57 Front Implement Detection Term A (MY13)
- B1 Air Filter Restriction Switch terminal B
- S4 Rear PTO Switch terminals 1 and 7(Pre MY08/MY08)
- S4 Rear PTO/RIO Switch terminals 1 and 3 (MY13)
- S5 Display Mode Switch
- S7 Rear (540) PTO Sensing Switch
- S8 Seat Switch
- S12 Park Brake Switch terminals A and C
- S10 MFWD Engagement Sensing Switch
- S11 Transmission Neutral Switch (PRT)
- S9 Mid PTO Switch (optional)
- S15 Brake Switch terminals B and D
- S21 Front PTO Switch terminals 1 and 7
- M2 Fuel Pump
- A1 Display Panel X7 Connector terminal K (Pre MY08)
- A1 Display Panel X7 Connector terminal K (MY08/MY13) (Not Used)
- A1 Display Panel X10 Connector terminals A, B, and K
- A1 Display Panel X11 Connector terminal A and D

These circuits are controlled by the key switch and are protected by the F1 fusible link, F7 fuse and F11 fuse.

Switched Power—eHydro™ Specific Circuits:

In addition to the main machine circuits, voltage must be present at several components of the eHydro™ machine during the following conditions: load match, brake switch, motion match, cruise switch, and Res/+, Set/- switches in off position if equipped.

- X33 Connector terminal A3
- S16 Load Match Switch
- X35 Connector terminal A
- S20 Cruise Switch terminals 2 and 5 (standard)

Continued on next page

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- S17 Res/+, Set/- Switch (optional)
- S18 Cruise/Max Speed Switch (optional)

These circuits are controlled by the key switch and are protected by the F1 fusible link and F7 and F11 fuses.

Secondary Switched Power:

Secondary switched voltage must be present at the following components during the following conditions: key switch in the run position, transmission in neutral, PTO(s) off, park brake locked, MFWD disengaged, and operator off seat:

- K1 Fuel Relay terminals 86 and 87
- A1 Display Panel X7 Connector terminal A, C (Old)
- A1 Display Panel X7 Connector terminal B, N (New)
- Y2 Fuel Shutoff Solenoid Red wire (after a short delay)
- Y2 Fuel Shutoff Solenoid Wht wire (for approximately 0.5 sec.)
- B3 Engine Coolant Temperature Sensor
- B4 Fuel Gauge Sensor
- K5 Flasher Relay terminals 49 and 49a (Old)
- K7 Flasher Relay terminals 49 and 49a (New)
- S13 Hazard Lights Switch terminal 5
- S14 Turn Signal Switch terminal 2
- X12 Connector terminal D (Old)

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- X4 Connector terminal F (New)
- X13 Trailer Connector terminal 2
- X33 Connector terminals G1

These circuits are controlled by the key switch and are protected by the F1 fusible link and the F7 fuse.

Secondary Switched Power—eHydro™ Specific Circuits:

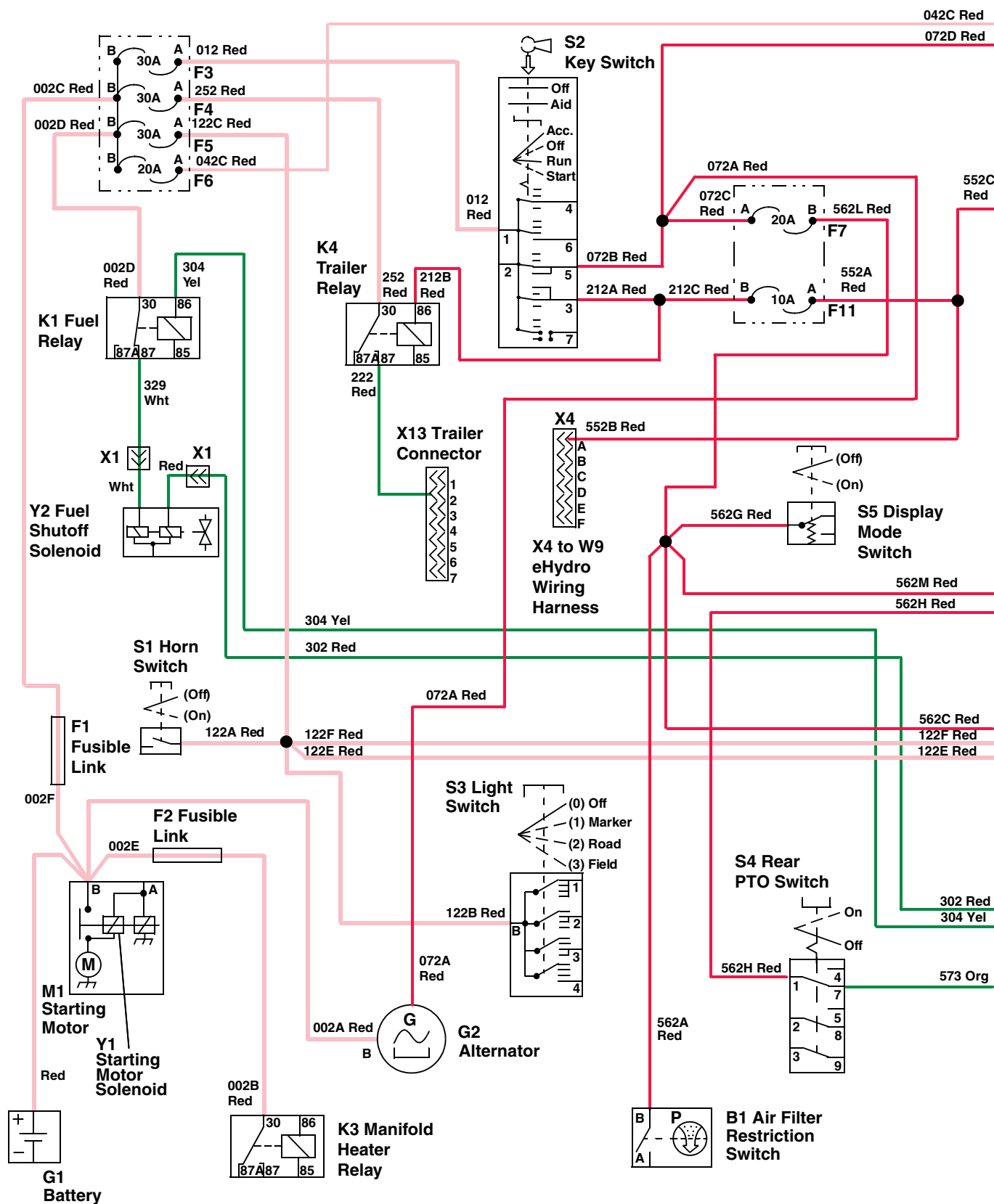
In addition to the main machine circuits, voltage must be present at several components of the eHydro™ machine. Those circuits that are outputs of the drive controller and should be at 5 volts during the following conditions: load match, brake switch, motion match, cruise switch, and Res/+, Set/- switches in off position if equipped.

- X33 Connector terminals B1 (5 volts)
- S19 Motion Match Switch terminal 5, (5 volts)
- T1 Forward Pedal Sensor terminal C, (5 volts)
- T4 Reverse Pedal Sensor terminal C, (5 volts)
- T2 Throttle Position Sensor terminal C, (5 volts)
- T3 MFWD Speed Sensor terminal A, (5 volts)

These circuits are controlled by the key switch and are protected by the F1 fusible link and F7 and F11 fuses.

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Power Circuit Electrical Schematic—W1 PRT and eHydro™ (Pre MY08)



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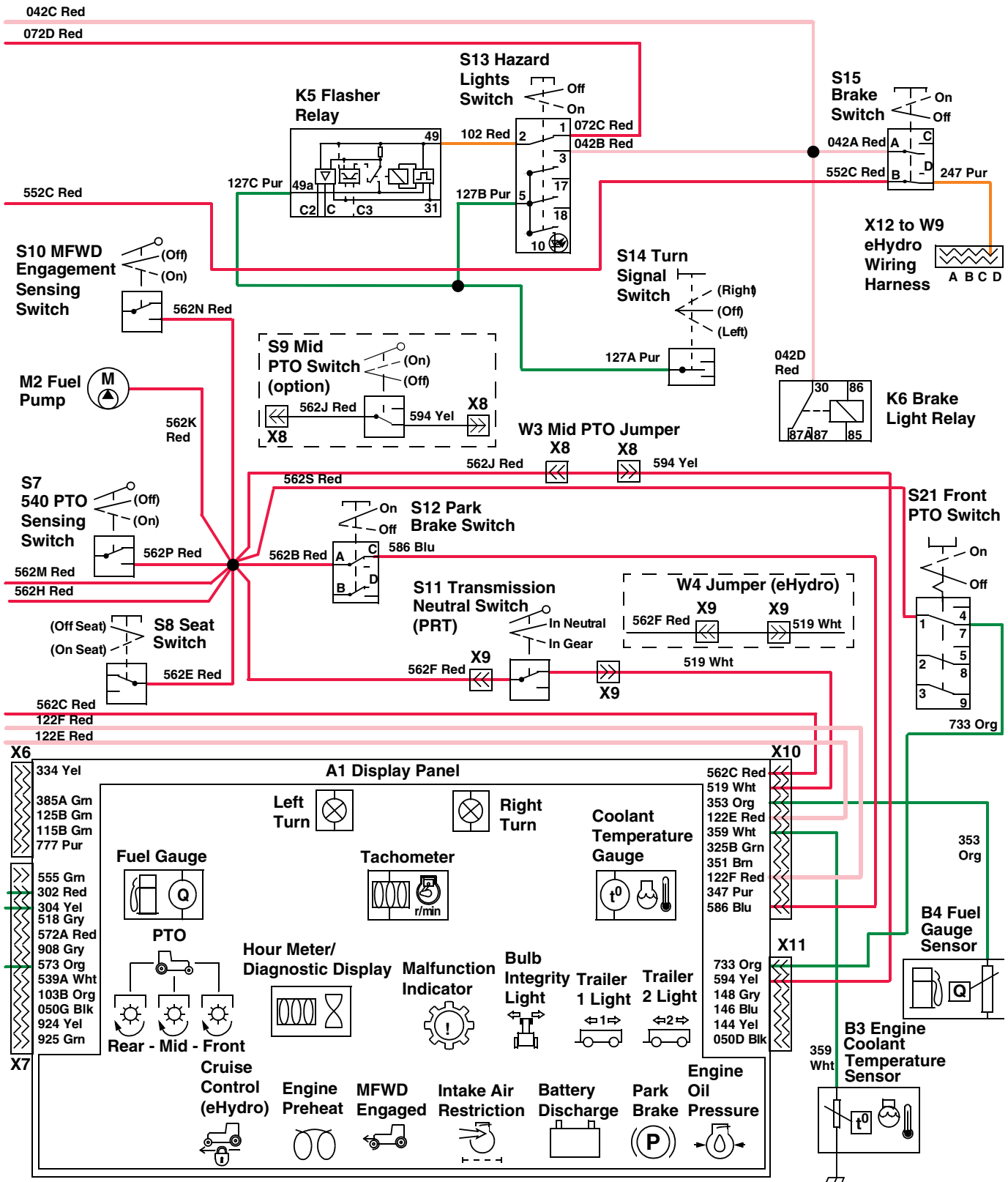
KN52281,1004379 -19-23OCT12-1/4

B1—Air Filter Restriction Switch	G1—Battery	S4—Rear PTO Switch	X13— W1 Main Wiring Harness
F1— Fusible Link	G2—Alternator	S5— Display Mode Switch	Trailer Connector
F2— Fusible Link	K1—Fuel Relay	X1— W1 Main Wiring Harness to	Y1— Starting Motor Solenoid
F3— Fuse 30A	K3—Manifold Heater Relay	Y2 Fuel Shutoff Solenoid	Y2— Fuel Shutoff Solenoid
F4— Fuse 30A	K4— Trailer Relay	X4— W1 Main Wiring Harness	
F5— Fuse 30A	M1—Starting Motor	to W9 eHydro™ Wiring	
F6— Fuse 20A	S1—Horn Switch	Harness	
F7— Fuse 20A	S2— Key Switch		
F11— Fuse 10A	S3— Light Switch		

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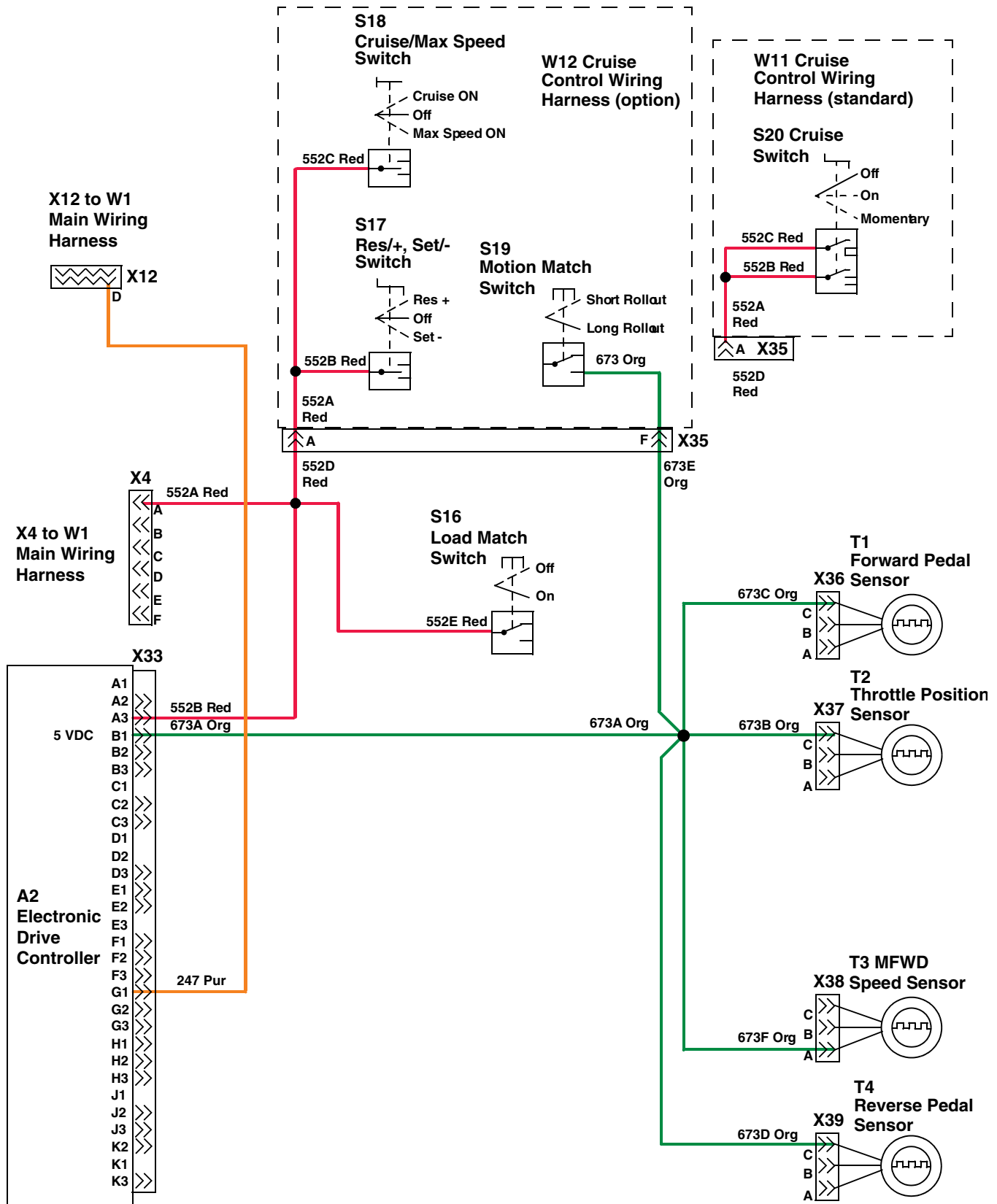
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A1—Display Panel	S11— Transmission Neutral Switch (PRT)	X8— W1 Main Wiring Harness to W3 Jumper Plug (standard), S9 Mid PTO Switch (optional)	X11— W1 Main Wiring Harness to A1 Display Panel
B3—Engine Coolant Temperature Sensor	S12— Park Brake Switch	X9— W1 Main Wiring Harness to S11 Transmission Neutral Switch (PRT), W4 Jumper Plug eHydro™	X12— W1 Main Wiring Harness to W9 eHydro™ Wiring Harness
B4—Fuel Gauge Sensor	S13— Hazard Lights Switch		
K5—Flasher Relay	S14— Turn Signal Switch		
K6—Brake Relay	S15— Brake Switch		
M2—Fuel Pump	S21— Front PTO Switch		
S7—Rear PTO Engagement Sensing Switch	W4—Jumper Plug	X10— W1 Main Wiring Harness to A1 Display Panel	
S8—Seat Switch	X6— W1 Main Wiring Harness to A1 Display Panel		
S9—Mid PTO Switch (optional)	X7— W1 Main Wiring Harness to A1 Display Panel		
S10— MFWD Engagement Sensing Switch			

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Power Circuit Electrical Schematic—W9 eHydro™



LVAL11943 —UN—12NOV10

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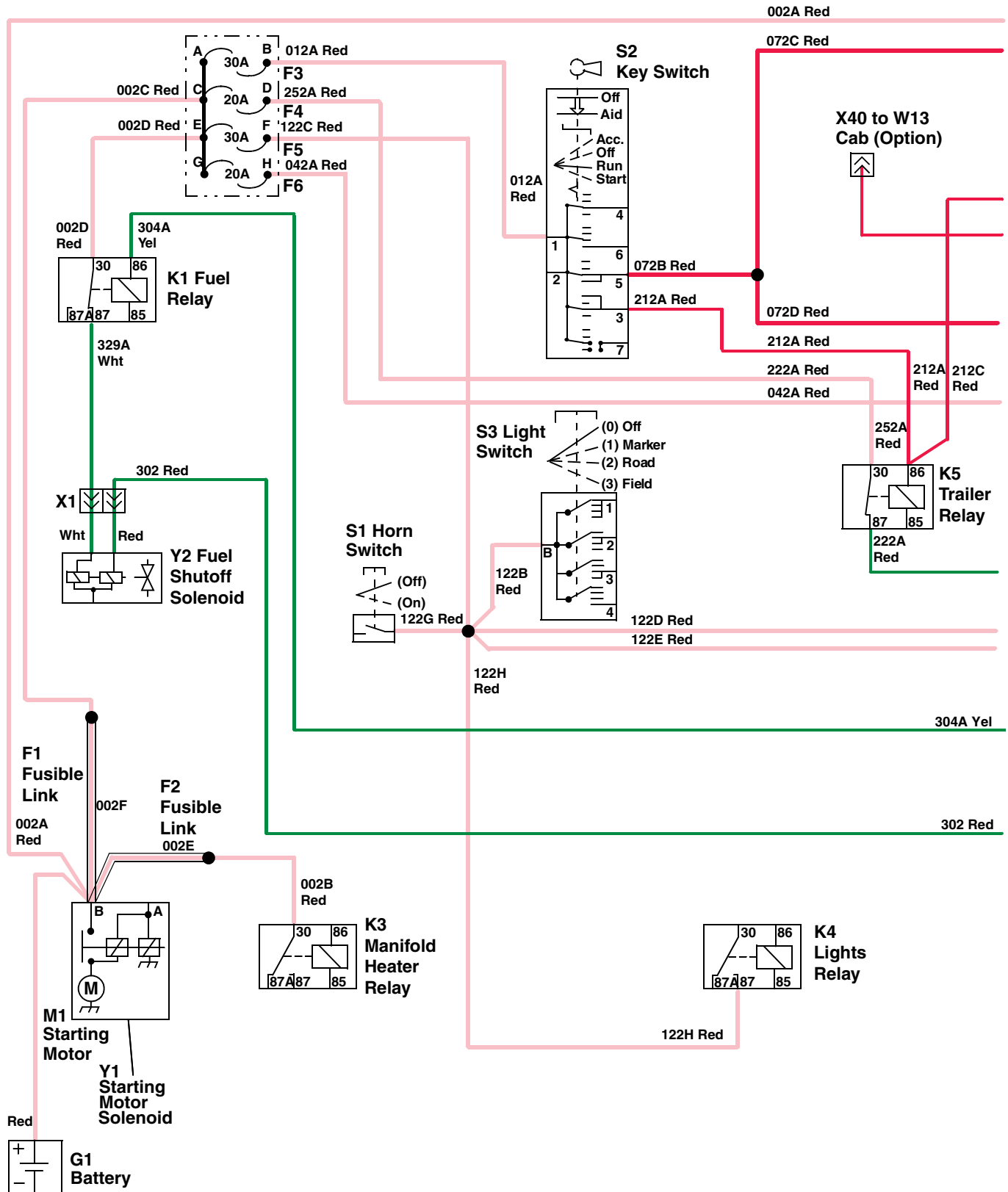
KN52281,100437A -19-23OCT12-1/2

A2—Electronic Drive Controller	T2— Throttle Position Sensor	X12— W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X37— W9 eHydro™ Wiring Harness to T2 Throttle Position Sensor
S16— Load Match Switch	T3— MFWD Speed Sensor	X33— W9 eHydro™ Wiring Harness to A2 Electronic Drive Controller	X38— W9 eHydro™ Wiring Harness to T3 MFWD Speed Sensor
S17— Res/+, Set/- Switch (optional)	T4— Reverse Pedal Sensor	X35— W9 eHydro™ Wiring Harness to W11 Cruise Control Wiring Harness (standard)	X39— W9 eHydro™ Wiring Harness to T4 Reverse Pedal Sensor
S18— Cruise Control/Max Speed Switch (optional)	W11—Cruise Control Wiring Harness (standard)	X36— W9 eHydro™ Wiring Harness to T1 Forward Pedal Sensor	
S19— Motion Match Switch (optional)	W12—Cruise Control Wiring Harness (optional)		
S20— Cruise Control Switch (standard)	X4— W1 Main Wiring Harness to W9 eHydro™ Wiring Harness		
T1— Forward Pedal Sensor			

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Power Circuit Electrical Schematic—W1 PRT and eHydro™—MY08



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F1— Fusible Link
F2— Fusible Link
F3— Fuse 30A
F4— Fuse 20A
F5— Fuse 30A
F6— Fuse 20A
G1—Battery
K1—Fuel Relay

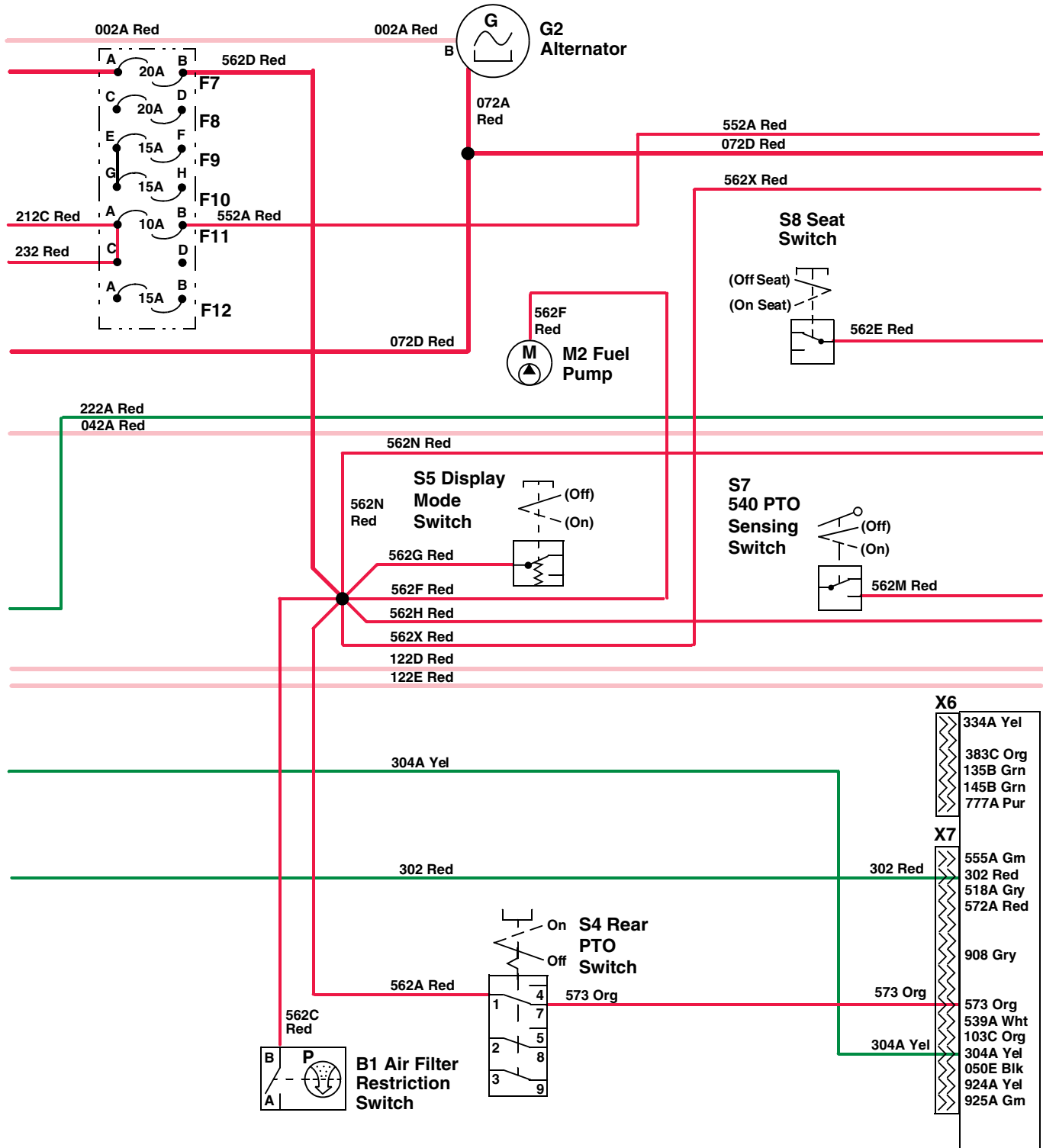
K3—Manifold Heater Relay
K4—Lights Relay
K5—Trailer Relay
M1—Starting Motor
S1—Horn Switch
S2—Key Switch

S3—Light Switch
X1—W1 Main Wiring Harness to
Y2 Fuel Shutoff Solenoid
X40— W1 Main Wiring Harness to
W13 Cab Wiring Harness

Y1—Starting Motor Solenoid
Y2—Fuel Shutoff Solenoid

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B1—Air Filter Restriction Switch
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 15A
F10— Fuse 15A

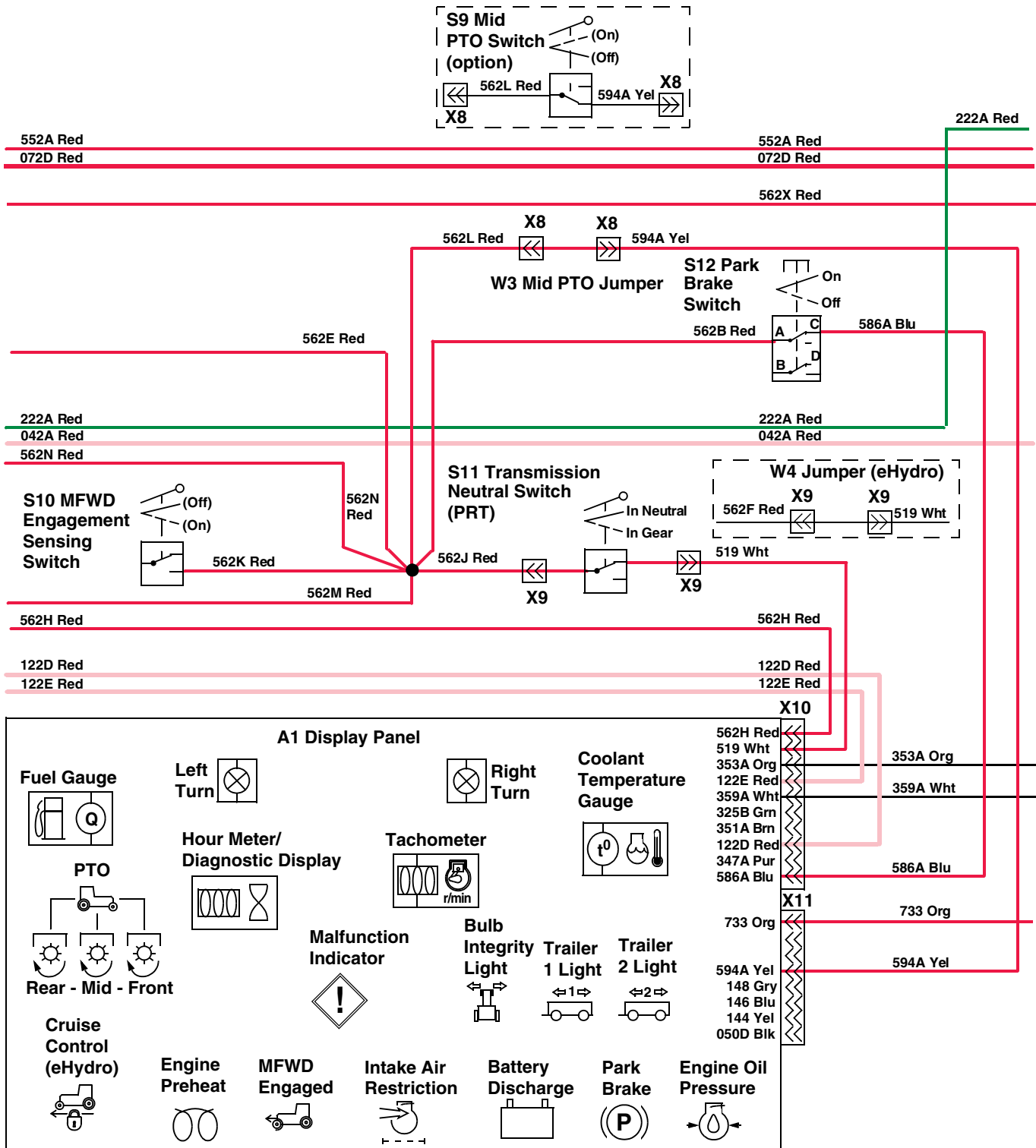
F11— Fuse 10A
F12— Fuse 15A
G2—Alternator
M2—Fuel Pump
S4— Rear PTO Switch
S5— Display Mode Switch

S7—Rear PTO Engagement
Sensing Switch
S8— Seat Switch
X6— W1 Main Wiring Harness to
A1 Display Panel

X7—W1 Main Wiring Harness to
A1 Display Panel

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A1—Display Panel
S9—Mid PTO Switch (option)
S10— MFWD Engagement
Sensing Switch
S11— Transmission Neutral
Switch (PRT)
S12— Park Brake Switch

W3—Mid PTO Jumper Plug
W4—Jumper Plug (eHydro™)
X8— W1 Main Wiring Harness to
W3 Jumper Plug (standard),
S9 Mid PTO Switch (optional)

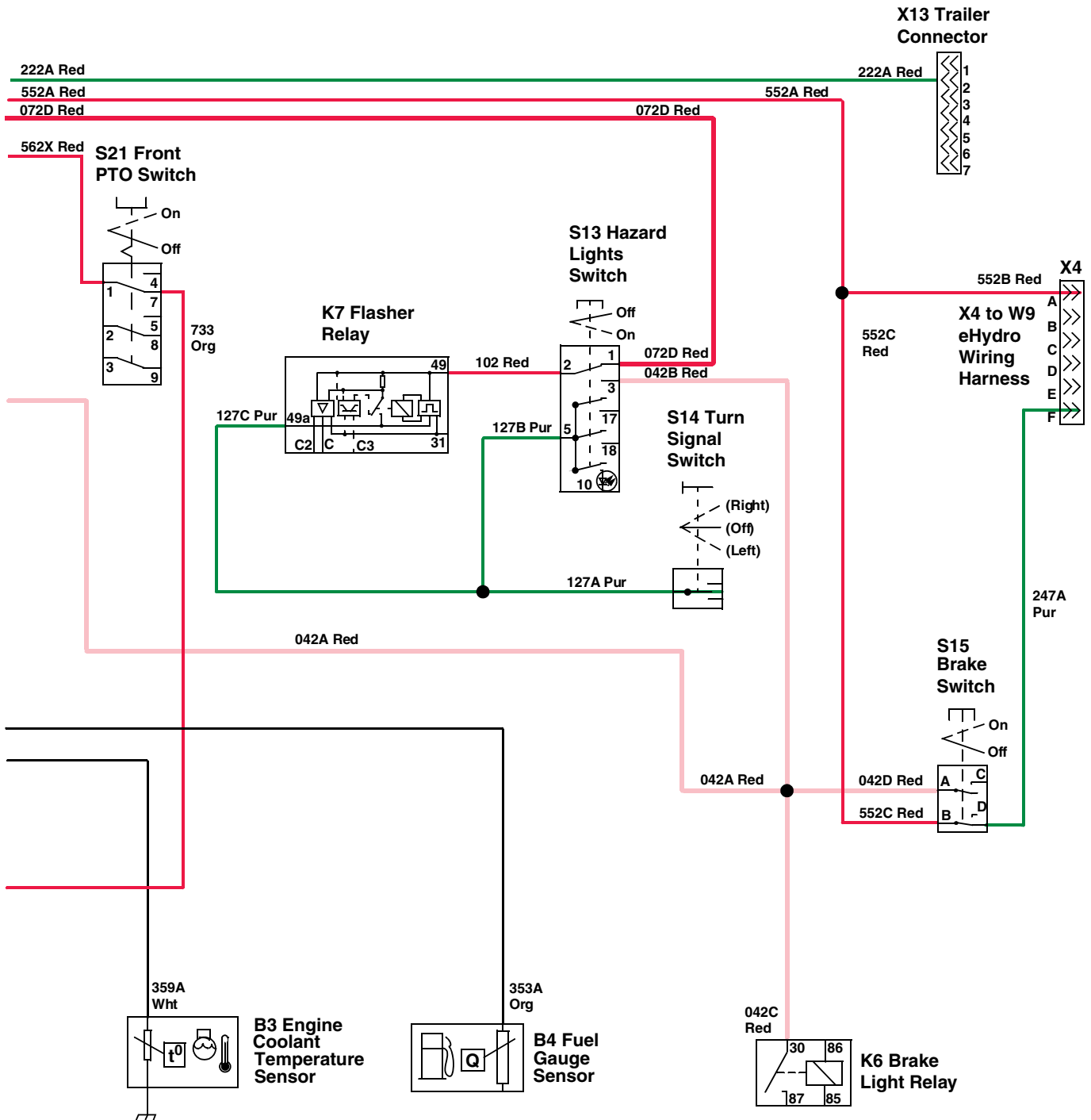
X9— W1 Main Wiring Harness to
S11 Transmission Neutral
Switch (PRT), W4 Jumper
Plug eHydro™

X10— W1 Main Wiring Harness
to A1 Display Panel
X11— W1 Main Wiring Harness
to A1 Display Panel

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B3—Engine Coolant Temperature
Sensor
B4—Fuel Gauge Sensor
K6—Brake Light Relay
K7—Flasher Relay

S13— Hazard Lights Switch
S14— Turn Signal Switch
S15— Brake Switch
S21— Front PTO Switch

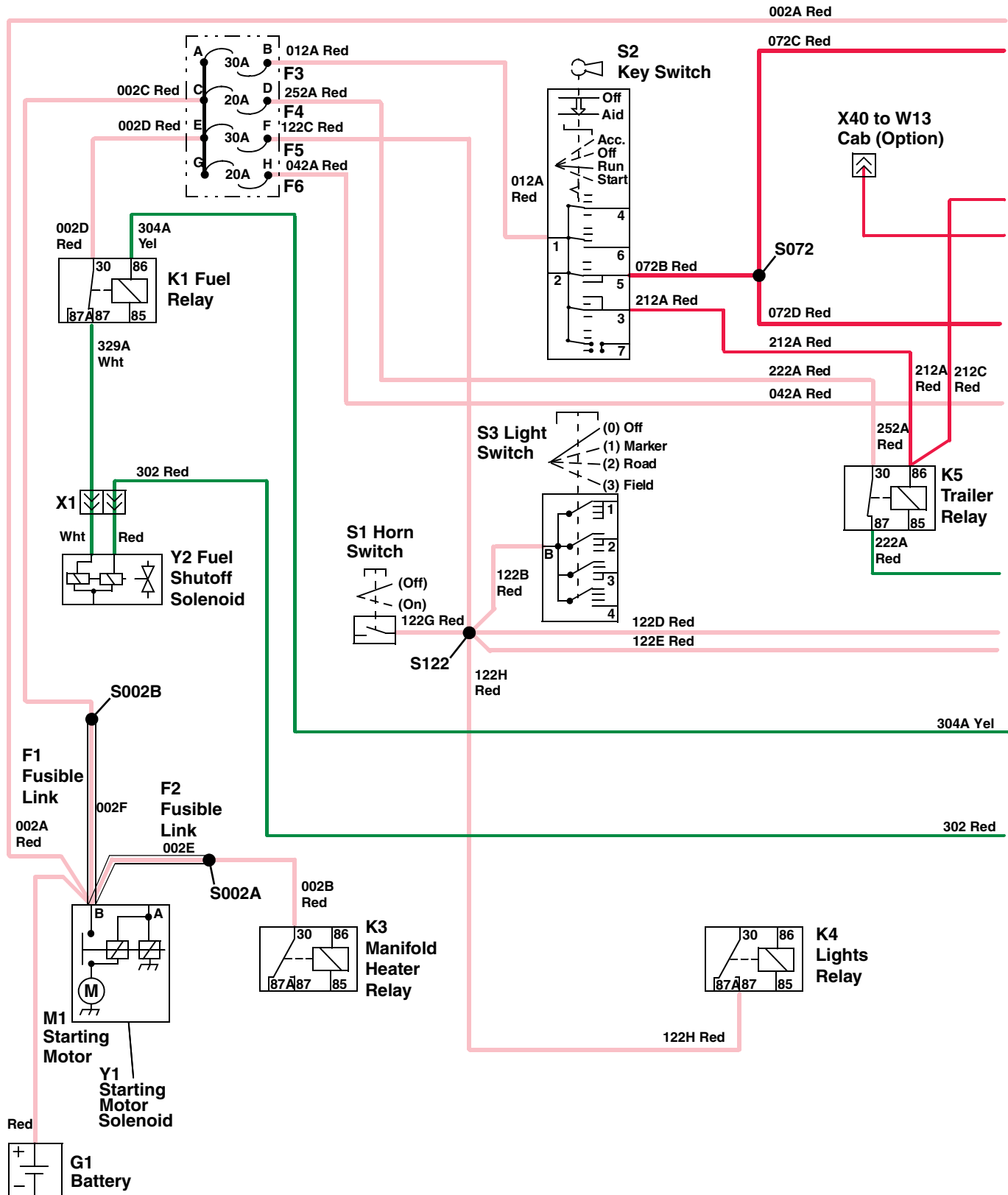
X4—W1 Main Wiring Harness
to W9 eHydro™ Wiring
Harness

X13— W1 Main Wiring Harness
Trailer Connector

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Power Circuit Electrical Schematic—W1 PRT and eHydro™—MY13



LVAL38878 —UN—15JAN13

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KN52281,10043C5 -19-10JAN13-1/8

F1— Fusible Link
F2— Fusible Link
F3— Fuse 30A
F4— Fuse 20A
F5— Fuse 30A
F6— Fuse 20A
G1—Battery
K1—Fuel Relay

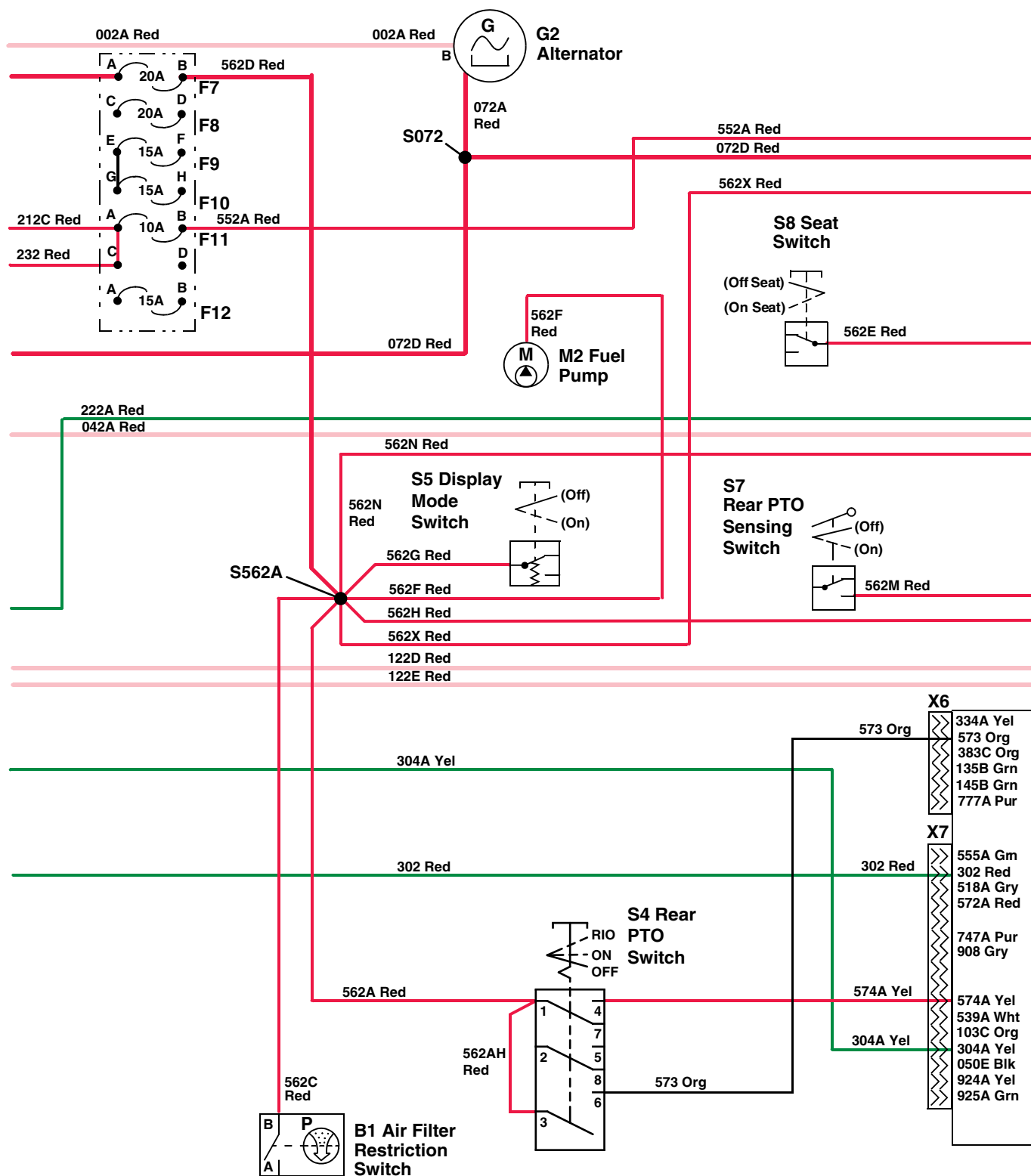
K3—Manifold Heater Relay
K4—Lights Relay
K5—Trailer Relay
M1—Starting Motor
S1—Horn Switch
S2—Key Switch

S3—Light Switch
X1—W1 Main Wiring Harness to
Y2 Fuel Shutoff Solenoid
X40— W1 Main Wiring Harness to
W13 Cab Wiring Harness
(optional)

Y1—Starting Motor Solenoid
Y2—Fuel Shutoff Solenoid

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LVAL38879—UN—15JAN13

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KN52281,10043C5 -19-10JAN13-3/8

B1—Air Filter Restriction Switch
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 15A
F10— Fuse 15A

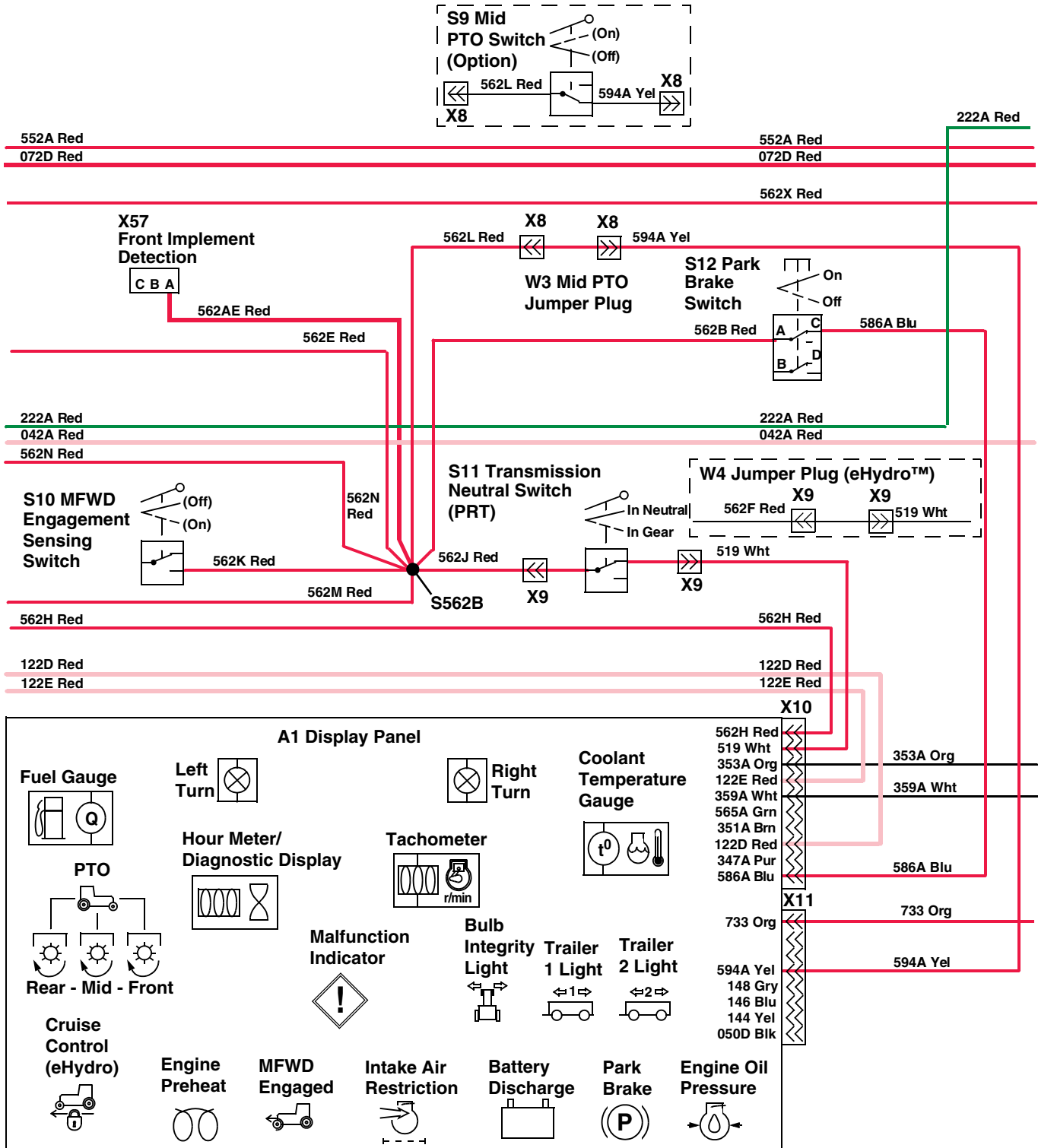
F11— Fuse 10A
F12— Fuse 15A
G2—Alternator
M2—Fuel Pump
S4— Rear PTO Switch
S5— Display Mode Switch

S7—Rear (540) PTO Sensing
Switch
S8— Seat Switch
X6— W1 Main Wiring Harness to
A1 Display Panel

X7—W1 Main Wiring Harness to
A1 Display Panel

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LVAL38880 —UN—15JAN13

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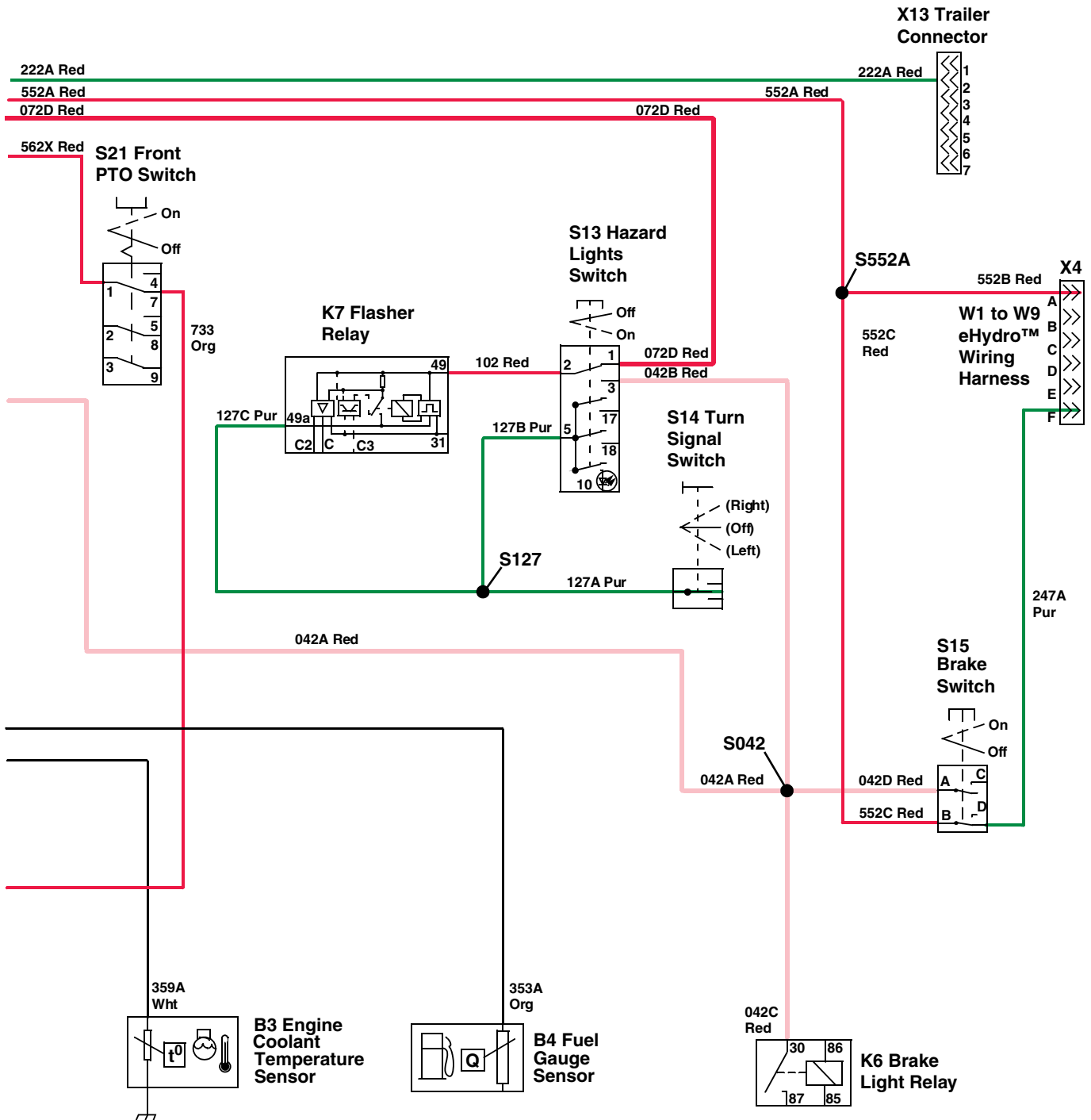
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A1—Display Panel	S12— Park Brake Switch	X9— W1 Main Wiring Harness to	X10— W1 Main Wiring Harness
S9— Mid PTO Switch (optional)	W3—Jumper Plug	S11 Transmission Neutral	to A1 Display Panel
S10— MFWD Engagement	W4—Jumper Plug	Switch (PRT), W4 Jumper	X11— W1 Main Wiring Harness
Sensing Switch	X8— W1 Main Wiring Harness to	Plug eHydro™	to A1 Display Panel
S11— Transmission Neutral	W3 Jumper Plug (standard),		
Switch (PRT)	S9 Mid PTO Switch (optional)		

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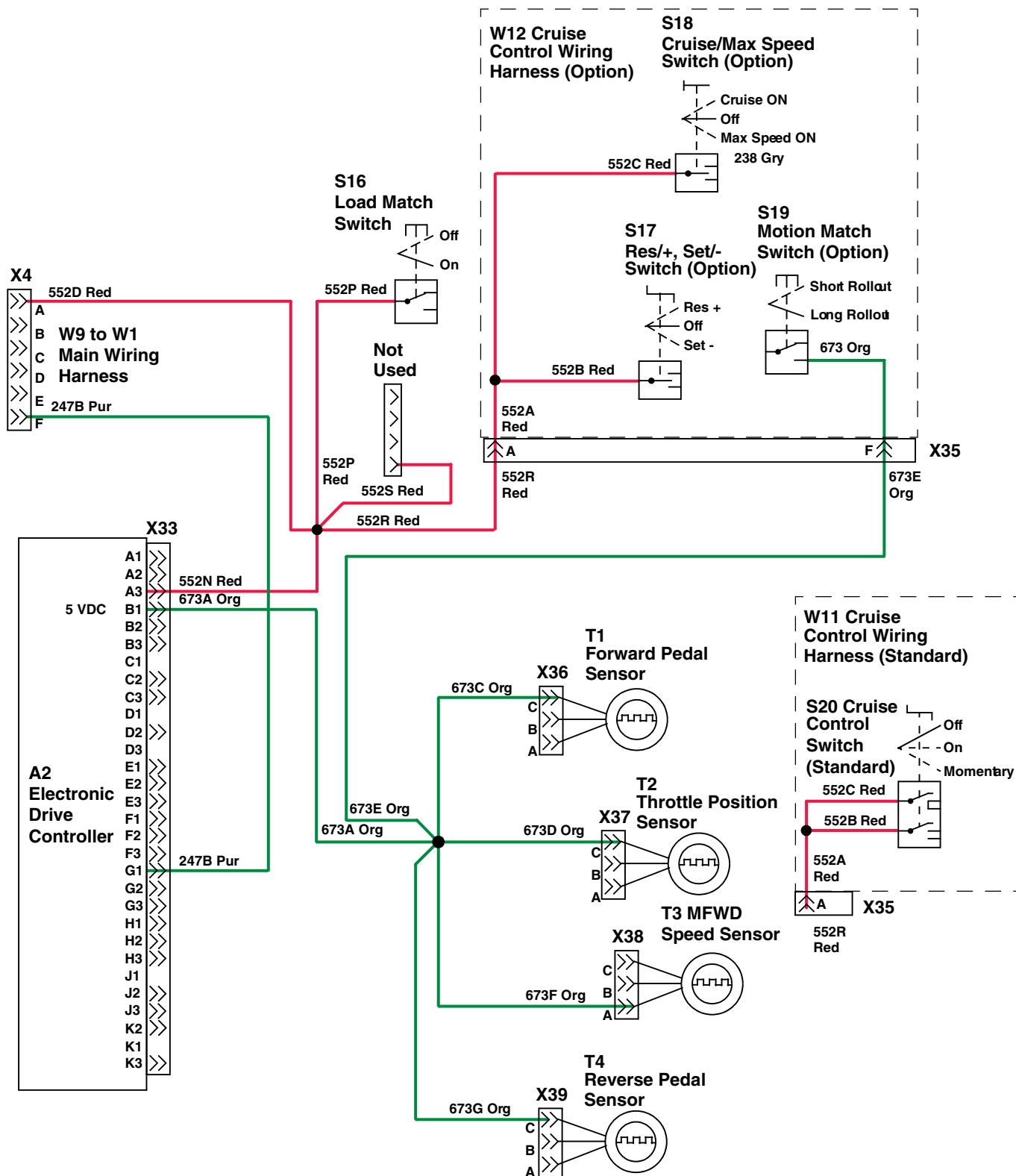
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B3—Engine Coolant Temperature Sensor	K7—Flasher Relay	S21— Front PTO Switch
B4—Fuel Gauge Sensor	S13— Hazard Lights Switch	X4— W1 Main Wiring Harness to W9 Wiring Harness
K6—Brake Light Relay	S14— Turn Signal Switch	X13— W1 Main Wiring Harness Trailer Connector
	S15— Brake Switch	

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Power Circuit Electrical Schematic—W9 eHydro™—MY08



LVAL11948—UN—15JAN13

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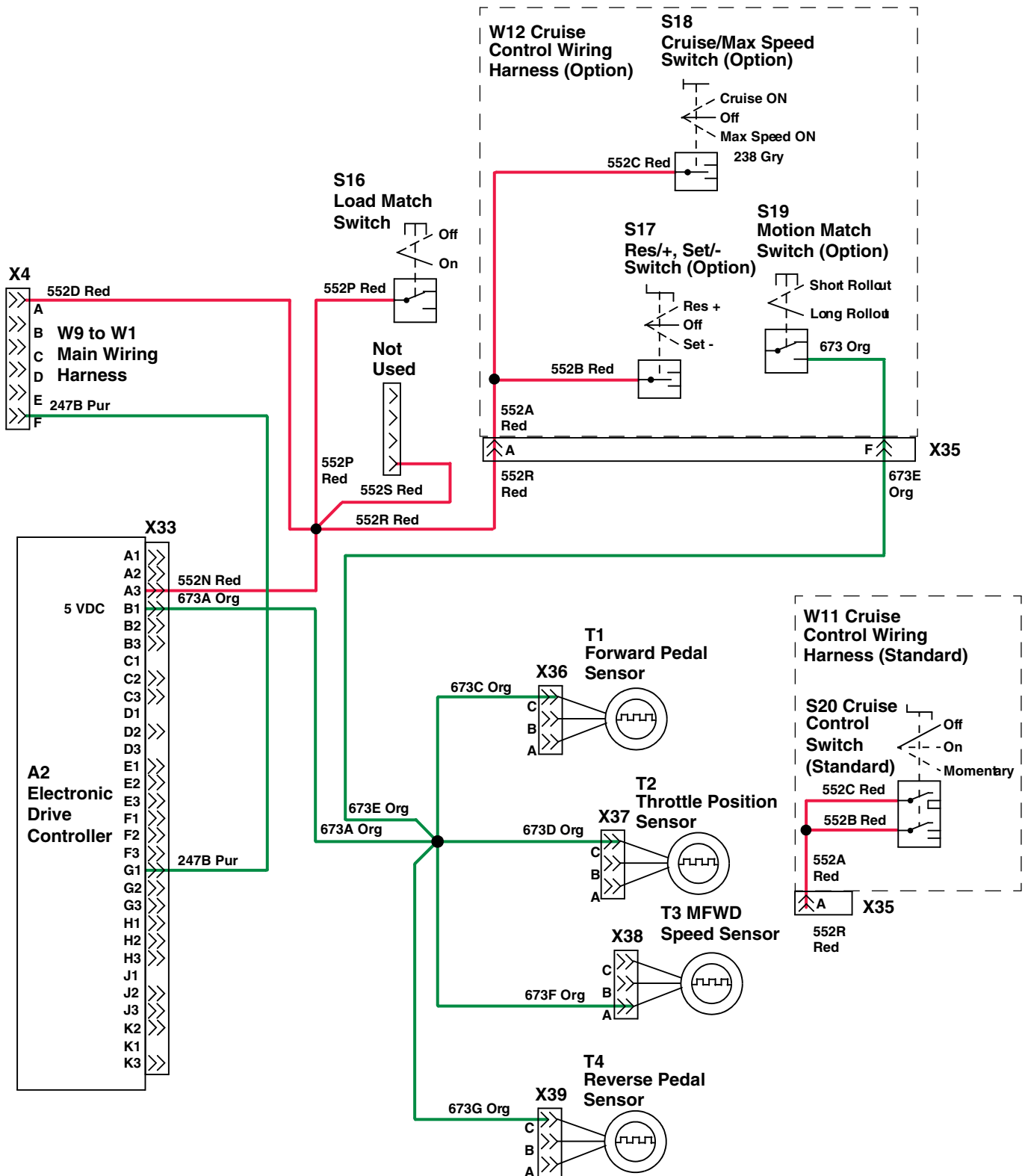
KN52281,100437C -19-23OCT12-1/2

A2—Electronic Drive Controller	T2— Throttle Position Sensor	X28— W1 Main Wiring Harness to	X37— W9 eHydro™ Wiring
S16— Load Match Switch	T3— MFWD Speed Sensor	W7 Left Rear Lights Wiring	Harness to T2 Throttle
S17— Res/+, Set/- Switch	T4— Reverse Pedal Sensor	Harness	Position Sensor
(optional)	W11—Cruise Control Wiring	X33— W9 eHydro™ Wiring	X38— W9 eHydro™ Wiring
S18— Cruise Control/Max Speed	Harness (standard)	Harness to A2 Electronic	Harness to T3 MFWD
Switch (optional)	W12—Cruise Control Wiring	Drive Controller	Speed Sensor
S19— Motion Match Switch	Harness (optional)	X35— W9 eHydro™ Wiring	X39— W9 eHydro™ Wiring
(optional)	X4— W1 Main Wiring Harness	Harness to W11 Cruise	Harness to T4 Reverse
S20— Cruise Control Switch	to W9 eHydro™ Wiring	Control Wiring Harness	Pedal Sensor
(standard)	Harness	(standard)	
T1— Forward Pedal Sensor		X36— W9 eHydro™ Wiring	
		Harness to T1 Forward	
		Pedal Sensor	

eHydro is a trademark of Deere & Company

KN52281,100437C -19-23OCT12-2/2

Power Circuit Electrical Schematic—W9 eHydro™—MY13



LVAL11948—UN—15JAN13

Continued on next page

KN52281,10043C6 -19-15JAN13-1/2

A2—Electronic Drive Controller	T1— Forward Pedal Sensor	X33— W9 Wiring Harness to A2	X37— W9 Wiring Harness to T2
S16— Load Match Switch	T2— Throttle Position Sensor	Electronic Drive Controller	Throttle Position Sensor
S17— Res/+, Set/- Switch	T3— MFWD Speed Sensor	X35— W9 Wiring Harness to	X38— W9 Wiring Harness to T3
(optional)	T4— Reverse Pedal Sensor	W11 Cruise Control Wiring	MFWD Speed Sensor
S18— Cruise Control/Max Speed	W11—Cruise Control Wiring	Harness (standard)	X39— W9 Wiring Harness to T4
Switch (optional)	Harness (standard)		Reverse Pedal Sensor
S19— Motion Match Switch	W12—Cruise Control Wiring	X35— W9 Wiring Harness to	
(optional)	Harness (optional)	W12 Cruise Control Wiring	
S20— Cruise Control Switch	X4—W1 Main Wiring Harness to	Harness (optional)	
(standard)	W9 Wiring Harness	X36— W9 Wiring Harness to T1	
		Forward Pedal Sensor	

KN52281,10043C6 -19-15JAN13-2/2

Power Circuit Diagnosis

Test Procedure A

Test Conditions:

- Key switch in off position.

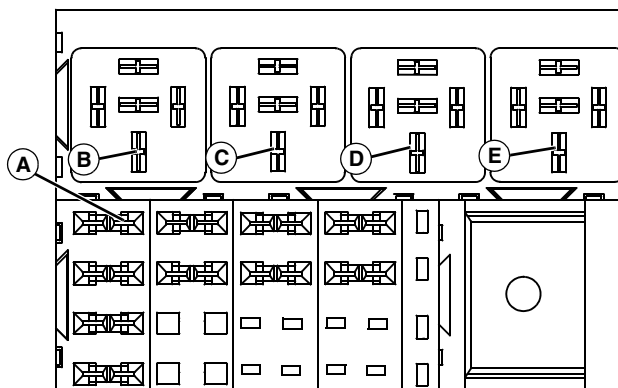
KN52281,100437D -19-11JAN13-1/43

Unswitched Power Circuits

KN52281,100437D -19-11JAN13-2/43

Step 1

NOTE: Relay positions are different between old and new machines. Check machine specific load center arrangements. (See *Load Center—Pre MY08* in Section 50, Group 15.) and (see *Load Center—MY08* in Section 50, Group 20.)



LVAL11949 —UN—12NOV10

Load Center

A—F3, F4, F5 and F6 Fuses, 002C Red Wire

B—K1 Fuel Relay—New

C—K1 Fuel Relay—Old

D—Terminal 30, 252 Red Wire

E—Terminal 30, 042 Red Wire

Is battery voltage present at F3, F4, F5 and F6 row of fuses, 002C (A) Red wires?

YES: Install F3 and F5 fuses. Go to next step.

NO: Check F1 fusible link. Test battery. Check 002D and 002C Red wires and connections.

KN52281,100437D -19-11JAN13-3/43

Step 2

Remove K1 fuel relay. Is battery voltage present at K1 fuel relay, terminal 30, 002D Red wire (C—Old) (B—New)?

YES: Install K1 fuel relay. Go to next step.

NO: Check F1 fusible link. Test battery. Check 002C Red wire and connections.

Continued on next page

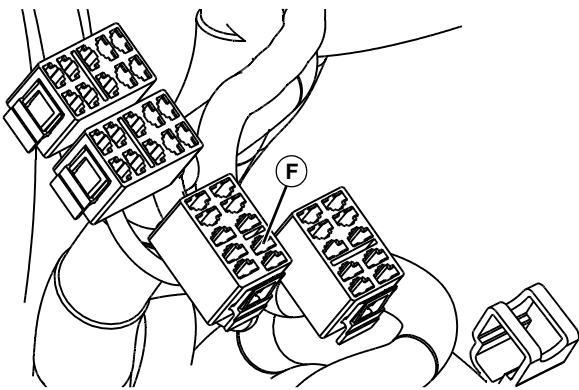
KN52281,100437D -19-11JAN13-4/43

Step 3	Remove K4 or K5 trailer relay. Is battery voltage present at K4 (Old) or K5 (New) trailer relay, terminal 30, 252 Red wire (D)?	YES: Install trailer relay. Go to next step. NO: Check F4 fuse. Check 252 Red wire and connections.
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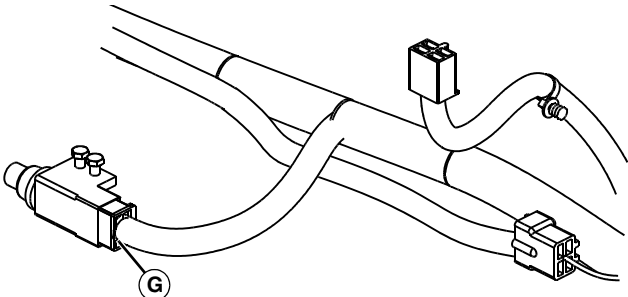
KN52281,100437D -19-11JAN13-5/43

Step 4	Remove K6 brake light relay. Is battery voltage present at K6 brake light relay, terminal 30, 042 Red wire (E)?	YES: Install brake light relay. Go to next step. NO: Check F6 fuse. Check 042 Red wires and connections.
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KN52281,100437D -19-11JAN13-6/43

Step 5	 <p>LVAL11950 —UN—12NOV10</p> <p>F—S13 Hazard Light Switch Connector Terminal 3, 042B Red Wire</p> <p>Is battery voltage present at S13 hazard light switch, terminal 3, 042B Red wire (F)?</p>	YES: Go to next step. NO: Check 042 Red wires and connections.
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KN52281,100437D -19-11JAN13-7/43

Step 6	 <p>LVAL11951 —UN—12NOV10</p> <p>G—S15 Brake Switch Connector Terminal A, 042D Red Wire</p> <p>Is battery voltage present at S15 brake switch, terminal A, 042D Red wire (G)?</p>	YES: Go to next step. NO: Check 042 Red wires and connections.
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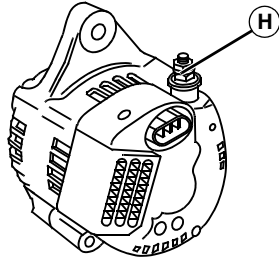
KN52281,100437D -19-11JAN13-8/43

Step 7	Remove K3 manifold heater relay. Is battery voltage present at connector terminal 30, 002B Red wire?	YES: Install K3 manifold heater fuel relay. Go to next step. NO: Check F2 fusible link. Test battery. Check 002B Red wire and connections.
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KN52281,100437D -19-11JAN13-9/43

Step 8



LVAL11952 —UN—12NOV10

H—G2 Alternator Terminal B, 002A Red Wire

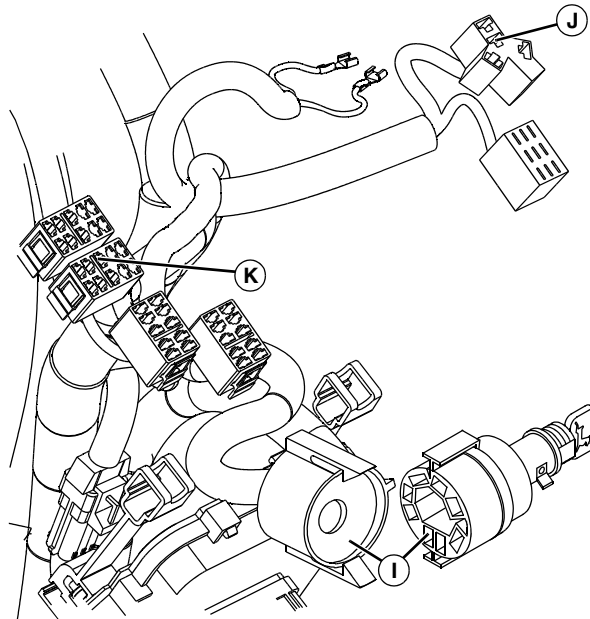
Is battery voltage present at G2 alternator terminal B, 002A Red wire (H)?

YES: Go to next step.

NO: Test battery. Check 002A Red wire and connections.

KN52281,100437D -19-11JAN13-10/43

Step 9



LVAL11953 —UN—12NOV10

I— S2 Key Switch Terminal 1, 012A Red Wire

J— S3 Light Switch Terminal B, 122B Red Wire

K—S1 Horn Switch, 122 Red Wire

Is battery voltage present at S2 key switch terminal 1, 012A Red wire (I)?

YES: Go to next step.

NO: Check F3 fuse. Check 012A Red wire and connections.

KN52281,100437D -19-11JAN13-11/43

Step 10

Is battery voltage present at S3 light switch terminal B, 122B Red wire (J)?

YES: Go to next step.

NO: Check F5 fuse. Check 122C and 122B Red wires and connections.

KN52281,100437D -19-11JAN13-12/43

Step 11

Is battery voltage present at S1 horn switch, 122 Red wire (K)?

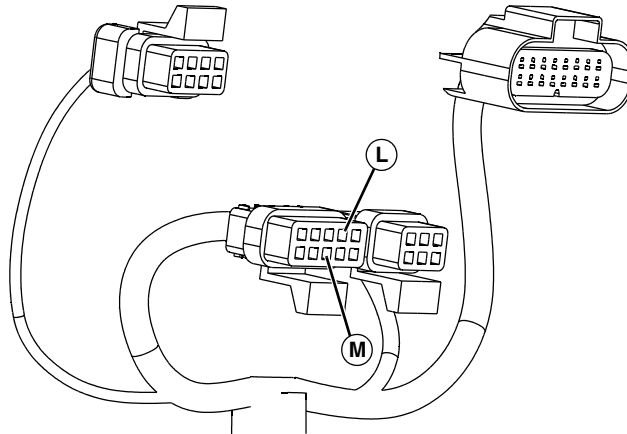
YES: Go to next step.

NO: Check 122 Red wires and connections.

Continued on next page

KN52281,100437D -19-11JAN13-13/43

Step 12



LVAL11954 —UN—12NOV10

L—Terminal D, 122 Red Wire
M—Terminal H, 122 Red Wire

Disconnect the X10 connector from the A1 display panel. Is battery voltage present at X10 connector terminal D (L) and H (M), 122 Red wires?

YES: Connect the X10 connector. Unswitched power circuit is ok, test switched power circuits.

NO: Check 122 Red wires and connections.

KN52281,100437D -19-11JAN13-14/43

Test Procedure B

Test Conditions:

- Key switch in run position, engine not running.
- Transmission in neutral (PRT).
- PTO(s) off.
- Brakes off.
- Park brake locked.
- MFWD disengaged.
- Operator off seat.
- Light switch off.
- Hazard light switch off.
- Turn signal switch off.

KN52281,100437D -19-11JAN13-15/43

Switched Power Circuits

KN52281,100437D -19-11JAN13-16/43

Step 1

Does display panel complete self test? Do gauges on display panel sweep to full right pin then back to left to required position? Example, fuel gauge at half full mark. Do all the indicator lights illuminate for 1 to 2 seconds? Do the battery discharge and park brake lights remain illuminated? Is the engine oil pressure indicator light flashing? Do all the segments of the LCD display illuminate for 1 to 2 seconds and then display the hours of operation?

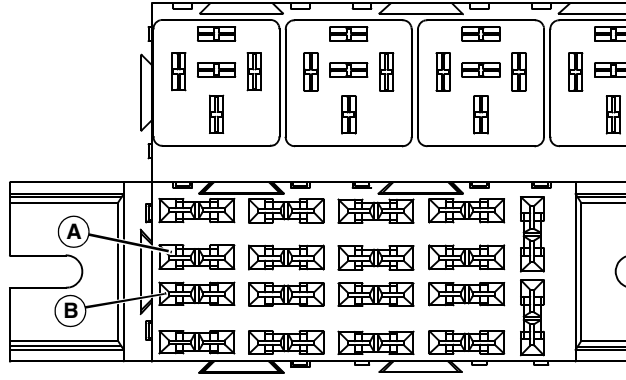
YES: Display panel is operational. Switched power circuit is functional. Go to next step.

NO: Check test conditions. Repeat test. Check unswitched power circuits. If ok, check individual circuits.

Continued on next page

KN52281,100437D -19-11JAN13-17/43

Step 2



LVAL11955 —UN—12NOV10

A—Terminal, 072C Red Wire
B—Terminal, 212C Red Wire

Remove F7 and F11 fuses. Are fuses ok? Is battery voltage present at F7 and F11 fuses, 072C (A) and 212C (B) Red wires?

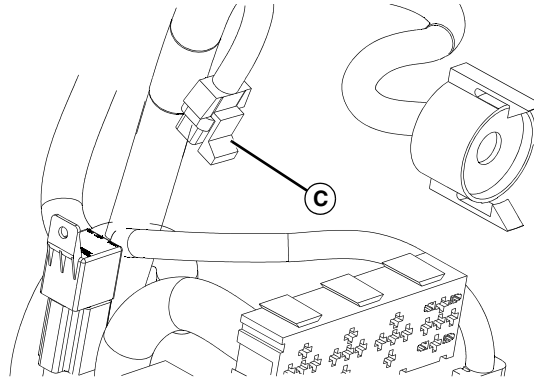
YES: Install F7 and F11 fuses. Go to next step.

NO: Replace fuse(s).

NO: Test key switch. Check 072, and 212 Red wires and connections.

KN52281,100437D -19-11JAN13-18/43

Step 3



LVAL11956 —UN—12NOV10

C—X4 Connector

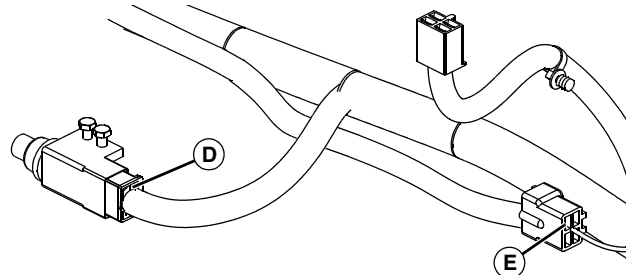
Disconnect X4 connector (C). Is battery voltage present at terminal A, 552B Red wire?

YES: Connect the X4 connector. Go to next step.

NO: Check the 552 Red wires and connections.

KN52281,100437D -19-11JAN13-19/43

Step 4



LVAL11957 —UN—12NOV10

D—S15 Brake Switch Connector Terminal B, 552C Red Wire
E—S15 Brake Switch Connector Terminal D, 247 Pur Wire

Is battery voltage present at S15 brake switch, terminal B, 552C Red wire (D)?

YES: Go to next step.

NO: Check the 552 and 552C Red wires and connections.

Continued on next page

KN52281,100437D -19-11JAN13-20/43

Step 5

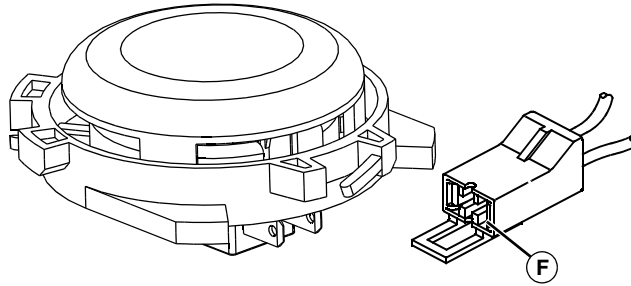
Is battery voltage present at X12 connector (old models), terminal D, 247 Pur wire (E)?
Is battery voltage present at X4 (C) connector (new models), terminal F, 247A Pur wire?

YES: Go to next step.

NO: Test brake switch.
Check the 247 Pur wire and connections.

KN52281,100437D -19-11JAN13-21/43

Step 6



LVAL11958 —UN—12NOV10

F—S8 Seat Switch, 562E Red Wire

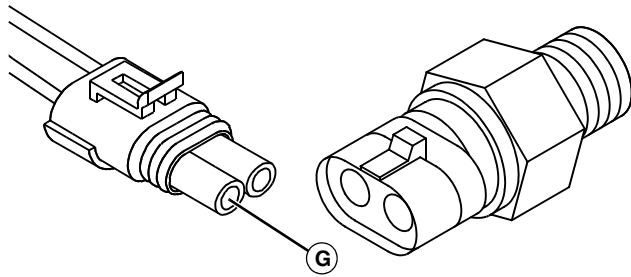
Is battery voltage present at the S8 seat switch, 562E Red wire (F)?

YES: Go to next step.

NO: Check the 562 Red wires.

KN52281,100437D -19-11JAN13-22/43

Step 7



LVAL11959 —UN—12NOV10

G—S7 PTO Sensing Switch, 562 Red Wire

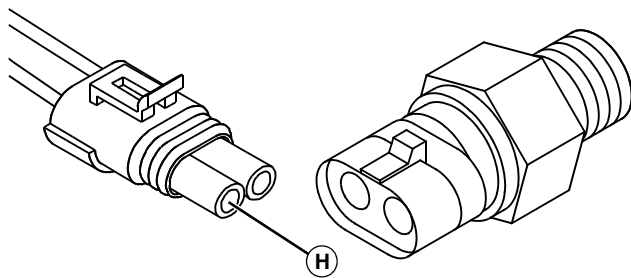
Is battery voltage present at the S7 PTO sensing switch, 562 Red wire (G)?

YES: Go to next step.

NO: Check the 562 Red wires.

KN52281,100437D -19-11JAN13-23/43

Step 8



LVAL11960 —UN—12NOV10

H—S10 MFWD Engagement Sensing Switch, 562 Red Wire

Is battery voltage present at the S10 MFWD engagement sensing switch, 562 Red wire (H)?

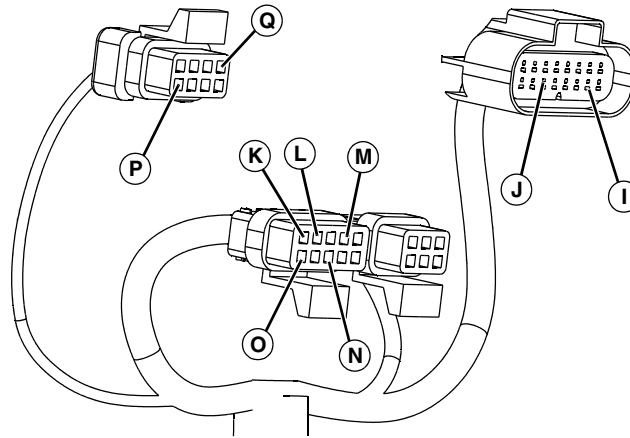
YES: Go to next step.

NO: Check the 562 Red wires.

Continued on next page

KN52281,100437D -19-11JAN13-24/43

Step 9



LVAL11961 —UN—12NOV10

I— X7 Connector Terminal K, 573 Org Wire
 J— X7 Connector Terminal P, 050 Blk Wire
 K—X10 Connector Terminal A, 562 Red Wire
 L—X10 Connector Terminal B, 519 Wht Wire
 M—X10 Connector Terminal D, 122E Red Wire
 N—X10 Connector Terminal H, 122 Red Wire
 O—X10 Connector Terminal K, 586 Blu Wire
 P—X11 Connector Terminal H, 050D Blk Wire
 Q—X11 Connector Terminal D, 594 Yel Wire

Disconnect the X7 connector to the display panel. Is battery voltage present at A1 display panel X7 connector terminal K 573 Org wire (I)?

YES: Go to next step.

NO: No voltage present at 573 Org wire. Test rear PTO switch. Check 573 Org wire and connections.

KN52281,100437D -19-11JAN13-25/43

Step 10

Is continuity to ground present at X7 connector terminal P, 050 Blk wire (J)?

YES: Connect X7 connector. Go to next step.

NO: Check 050 Blk wires and connections.

KN52281,100437D -19-11JAN13-26/43

Step 11

Disconnect X10 connector to the display panel. Is battery voltage present at terminals A, 562 Red (K); B, 519 Wht (L); D, 122E Red (M); H, 122 Red (N); and K, 586 Blu (O) wires?

YES: Connect X10 connector. Go to next step.

NO: No voltage present at 562 Red wire. Test 562 Red wires and connections.

NO: No voltage present at 519 Wht wire. Test transmission neutral switch (PRT), or that jumper plug is in place on X9 connector (eHydro™). Check 519 Wht wire and connections.

NO: No voltage present at 122F Red wires. Check F7 fuse or unswitched power circuit.

NO: No voltage present at 586 Blu wire. Test park brake switch. Check 586 Blu wire and connections.

Continued on next page

KN52281,100437D -19-11JAN13-27/43

Step 12

Disconnect X11 connector to the display panel. Is battery voltage present at terminal D, 594 Yel (Q) wire?

YES: Go to next step.

NO: No voltage present at 594 Yel wire. Test mid PTO switch (optional), or that jumper plug is in place on X8 connector. Check 594 Yel wire and connections.

KN52281,100437D -19-11JAN13-28/43

Step 13

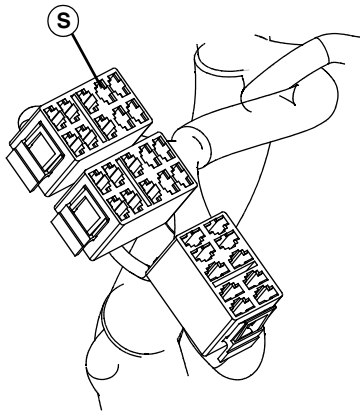
Is continuity to ground present at terminal H, 050D Blk wire (P)?

YES: Connect X11 connector. Go to next step.

NO: Check 050D and 050A Blk wires and connections.

KN52281,100437D -19-11JAN13-29/43

Step 14



LVAL11962 —UN—12NOV10

S—S4 or S5 Display Mode Switch Connector, 562G Red Wire

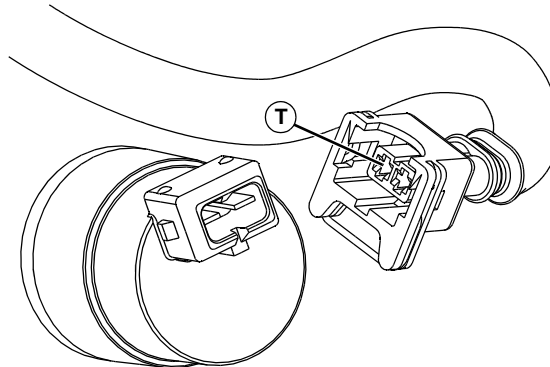
Disconnect the S4 or S5 display mode switch. Is battery voltage present at display mode switch connector 562G Red wire (S)?

YES: Connect display mode switch. Go to next step.

NO: Check the F7 fuse. Check the 562 Red wires.

KN52281,100437D -19-11JAN13-30/43

Step 15



LVAL11963 —UN—12NOV10

T—B1 Air Filter Restriction Switch Connector, 562 Red Wire

Disconnect the air filter restriction switch. Is battery voltage present at B1 air filter restriction switch connector 562 Red wire (T)?

YES: Connect the air filter restriction switch.

NO: Check the 562 Red wires.

Continued on next page

KN52281,100437D -19-11JAN13-31/43

Step 16

Is battery voltage present at S21 front PTO switch, 562 Red wire and 733 Org wire?

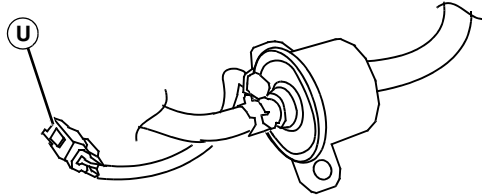
YES: Go to next step.

NO: 562S Red wire—Check 562 Red wires and connections.

NO: 733 Org wire—Ensure that front PTO switch is off. Test front PTO switch.

KN52281,100437D -19-11JAN13-32/43

Step 17



LVAL11964 —UN—12NOV10

U—M2 Fuel Pump Connector, 562 Red Wire

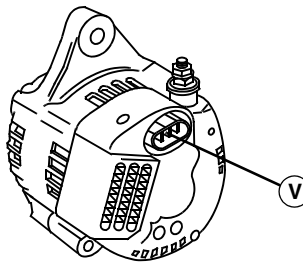
Is battery voltage present at 562 Red wire (U) of M2 fuel pump?

YES: Go to next step.

NO: Check 562 Red wires and connections.

KN52281,100437D -19-11JAN13-33/43

Step 18



LVAL11965 —UN—12NOV10

V—G2 Alternator, 072A Red Wire

Is battery voltage present at G2 alternator, 072A Red wire (V)?

YES: Test complete.

NO: Check 072 Red wires and connections.

KN52281,100437D -19-11JAN13-34/43

Test Procedure C

Test Conditions:

- Key switch in run position, engine not running.
- Transmission in neutral (PRT).
- PTO(s) off.
- Brakes off.

- Park brake locked.
- MFWD disengaged.
- Operator off seat.
- Light switch off.
- Hazard light switch off.
- Turn signal switch off.

KN52281,100437D -19-11JAN13-35/43

Secondary Switched Power Circuits

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KN52281,100437D -19-11JAN13-36/43

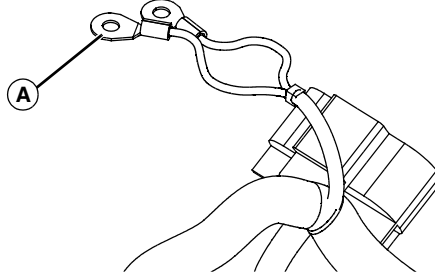
Step 1

Remove K1 fuel relay. Is battery voltage present at K1 fuel relay terminal 86, 304 Yel wire?

YES: Install fuel relay. Go to next step.
NO: Check that test conditions are met. Check 304 Yel wire and connections. If ok, replace display panel.

KN52281,100437D -19-11JAN13-37/43

Step 2



LVAL11966 —UN—12NOV10

A—B4 Fuel Gauge Sensor, 353 Org Wire

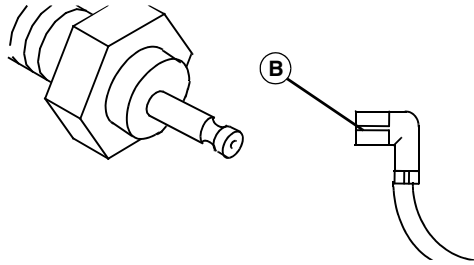
Is battery voltage present at B4 fuel gauge sensor, 353 Org wire (A)?

YES: Go to next step.

NO: Check 353 Org wire and connections. If ok, and test conditions are correct, replace display panel.

KN52281,100437D -19-11JAN13-38/43

Step 3



LVAL11967 —UN—12NOV10

B—B3 Engine Coolant Temperature Sensor, 359 Wht Wire

Is battery voltage present at B3 engine coolant temperature sensor, 359 Wht wire (B)?

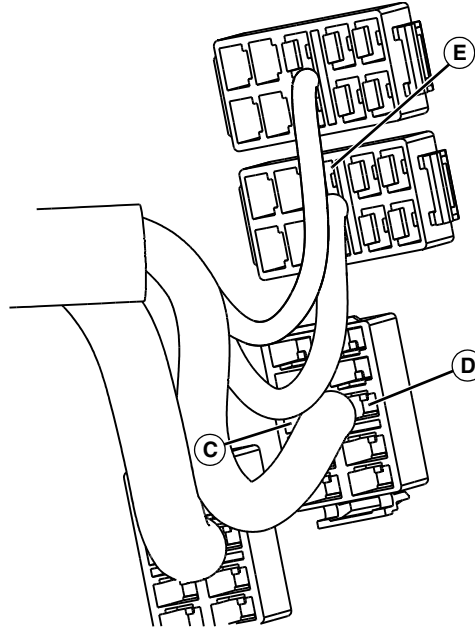
YES: Go to next step.

NO: Check 359 Wht wire and connections. If ok, and test conditions are correct, replace display panel.

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KN52281,100437D -19-11JAN13-39/43

Step 4



LVAL11968 —UN—12NOV10

C—S13 Hazard Lights Switch Connector Terminal 2, 102 Red Wire
D—S13 Hazard Lights Switch Connector Terminal 5, 127B Pur Wire
E—S14 Turn Signal Switch Connector Terminal 2, 127A Pur Wire

With the S13 hazard lights switch connected, is battery voltage present at hazard lights switch connector terminal 2, 102 Red wire (C)?

YES: Go to next step.

NO: Test hazard lights switch.

KN52281,100437D -19-11JAN13-40/43

Step 5

Is battery voltage present at S13 hazard lights switch connector terminal 5, 127B Pur wire (D)?

YES: Go to next step.

NO: Test flasher relay.
 Check the 127C and 127B Pur wires.

KN52281,100437D -19-11JAN13-41/43

Step 6

Is battery voltage present at S14 turn signal switch connector terminal 2, 127A Pur wire (E)?

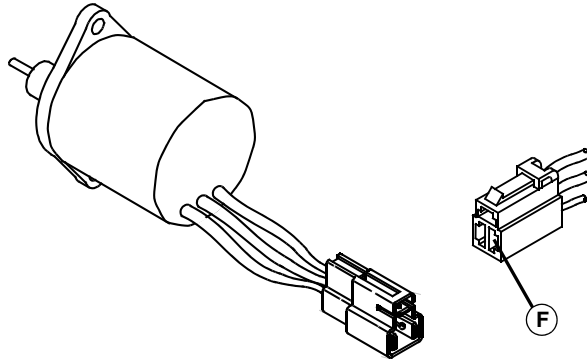
YES: Go to next step.

NO: Check the 127C and 127A Pur wires.

KN52281,100437D -19-11JAN13-42/43

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Step 7



LVAL11969 —UN—12NOV10

F—Y2 Fuel Shutoff Solenoid, 302 Red Wire

Is battery voltage present at Y2 fuel shutoff solenoid, 302 Red wire (F)?

YES: Test complete.

NO: Check that test conditions are met. Check 302 Red wire and connections. If ok, replace display panel.

KN52281,100437D -19-11JAN13-43/43

Power Circuit Diagnosis—MY13

Test Procedure A

Test Conditions

- Key switch in off position.

KN52281,10043C7 -19-21JAN13-1/42

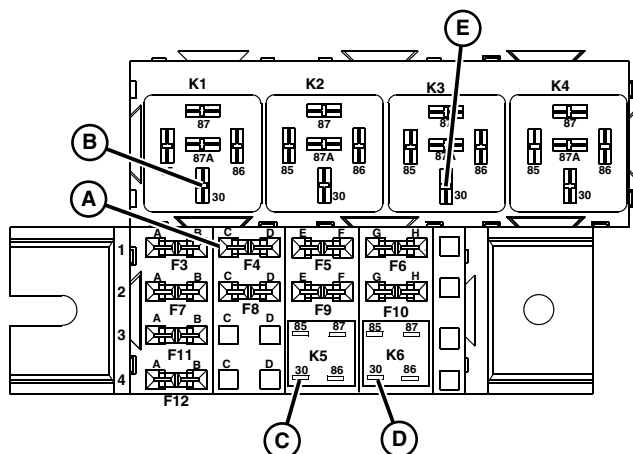
Unswitched Power Circuits—MY13

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KN52281,10043C7 -19-21JAN13-2/42

Step 1

NOTE: Relay positions are different between old and new machines. Check machine specific load center arrangements. (See Load Center—Pre MY08.) and (see Load Center—MY08.)



LVAL38936 —UN—27NOV12

Load Center MY13

- A**—F3, F4, F5 and F6 Fuses, 002C Red Wire
- B**—K1 Fuel Relay Terminal 30, 002D Red Wire
- C**—K5 Trailer Relay Terminal 30, 252A Red Wire
- D**—K6 Brake Light Relay Terminal 30, 042C Red Wire
- E**—K3 Manifold Heater Relay Terminal 30, 002B Red Wire

Is battery voltage present at F3, F4, F5 and F6 row of fuses, 002C (A) Red wires?

YES: Install F3 and F5 fuses. Go to next step.

NO: Check F1 fusible link. Test battery. Check 002D and 002C Red wires and connections.

KN52281,10043C7 -19-21JAN13-3/42

Step 2

Remove K1 fuel relay. Is battery voltage present at K1 fuel relay, terminal 30, 002D Red wire (B).

YES: Install K1 fuel relay. Go to next step.

NO: Check F1 fusible link. Test battery. Check 002D Red wire and connections.

KN52281,10043C7 -19-21JAN13-4/42

Step 3

Remove K5 trailer relay. Is battery voltage present at K5 trailer relay, terminal 30, 252A Red wire (C)?

YES: Install trailer relay. Go to next step.

NO: Check F4 fuse. Check 252A Red wire and connections.

KN52281,10043C7 -19-21JAN13-5/42

Step 4

Remove K6 brake light relay. Is battery voltage present at K6 brake light relay, terminal 30, 042C Red wire (D)?

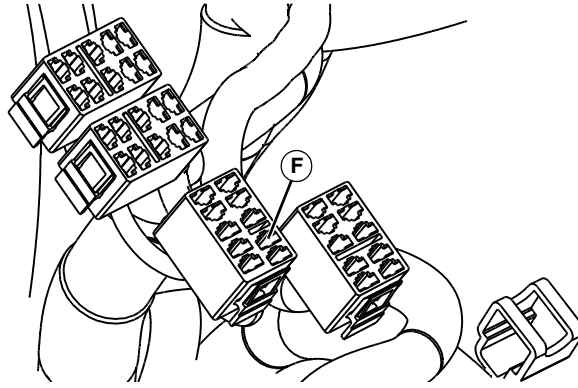
YES: Install brake light relay. Go to next step.

NO: Check F6 fuse. Check 042 Red wires and connections.

KN52281,10043C7 -19-21JAN13-6/42

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Step 5



LVAL11950 —UN—12NOV10

F—S13 Hazard Light Switch Connector Terminal 3, 042B Red Wire

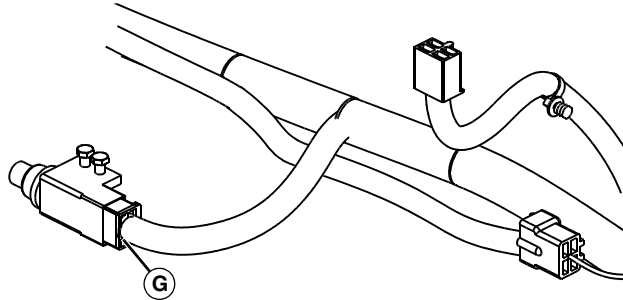
Is battery voltage present at S13 hazard light switch, terminal 3, 042B Red wire (F)?

YES: Go to next step.

NO: Check 042 Red wires and connections.

KN52281,10043C7 -19-21JAN13-7/42

Step 6



LVAL11951 —UN—12NOV10

G—S15 Brake Switch Connector Terminal A, 042D Red Wire

Is battery voltage present at S15 brake switch, terminal A, 042D Red wire (G)?

YES: Go to next step.

NO: Check 042 Red wires and connections.

KN52281,10043C7 -19-21JAN13-8/42

Step 7

Remove K3 manifold heater relay. Is battery voltage present at connector terminal 30, 002B Red wire?

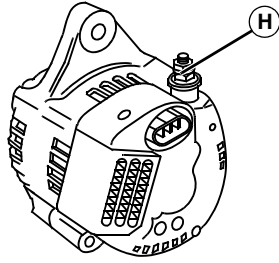
YES: Install K3 manifold heater fuel relay. Go to next step.

NO: Check F2 fusible link. Test battery. Check 002B Red wire and connections.

Continued on next page

KN52281,10043C7 -19-21JAN13-9/42

Step 8



LVAL11952 —UN—12NOV10

H—G2 Alternator Terminal B, 002A Red Wire

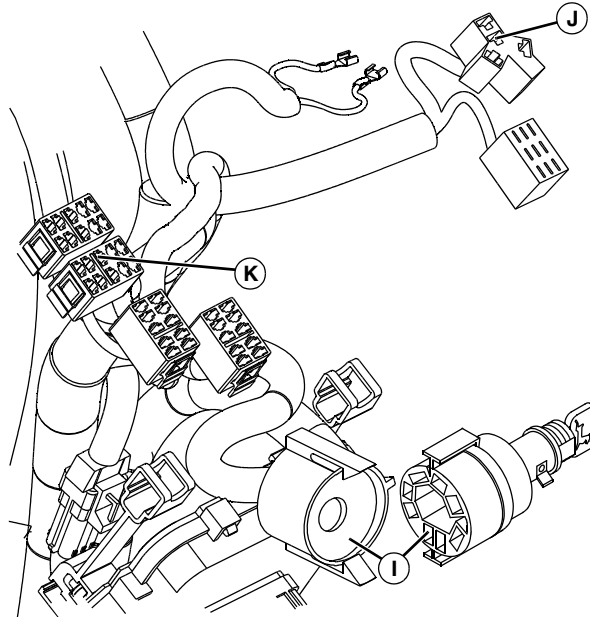
Is battery voltage present at G2 alternator terminal B, 002A Red wire (H)?

YES: Go to next step.

NO: Test battery. Check 002A Red wire and connections.

KN52281,10043C7 -19-21JAN13-10/42

Step 9



LVAL11953 —UN—12NOV10

I— S2 Key Switch Terminal 1, 012A Red Wire

J— S3 Light Switch Terminal B, 122B Red Wire

K—S1 Horn Switch, 122G Red Wire

Is battery voltage present at S2 key switch terminal 1, 012A Red wire (I)?

YES: Go to next step.

NO: Check F3 fuse. Check 012A Red wire and connections.

KN52281,10043C7 -19-21JAN13-11/42

Step 10

Is battery voltage present at S3 light switch terminal B, 122B Red wire (J)?

YES: Go to next step.

NO: Check F5 fuse. Check 122C and 122B Red wires and connections.

KN52281,10043C7 -19-21JAN13-12/42

Step 11

Is battery voltage present at S1 horn switch, 122G Red wire (K)?

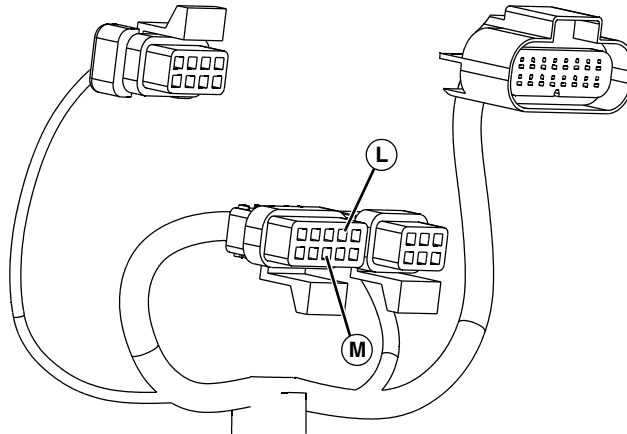
YES: Go to next step.

NO: Check 122G Red wires and connections.

KN52281,10043C7 -19-21JAN13-13/42

Continued on next page

Step 12



LVAL11954 —UN—12NOV10

L—Terminal D, 122E Red Wire
M—Terminal H, 122D Red Wire

Disconnect the X10 connector from the A1 display panel. Is battery voltage present at X10 connector terminal D (L) and H (M), 122 Red wires?

YES: Connect the X10 connector. Unswitched power circuit is ok, test switched power circuits.

NO: Check 122 Red wires and connections.

KN52281,10043C7 -19-21JAN13-14/42

Test Procedure B

Test Conditions

- Key switch in run position, engine not running.
- Transmission in neutral (PRT).
- PTO(s) off.
- Brakes off.

- Park brake locked.
- MFWD disengaged.
- Operator off seat.
- Light switch off.
- Hazard light switch off.
- Turn signal switch off.

KN52281,10043C7 -19-21JAN13-15/42

Switched Power Circuits

KN52281,10043C7 -19-21JAN13-16/42

Step 1

Does display panel complete self test? Do gauges on display panel sweep to full right pin then back to left to required position? Example, fuel gauge at half full mark. Do all the indicator lights illuminate for 1 to 2 seconds? Do the battery discharge and park brake lights remain illuminated? Is the engine oil pressure indicator light flashing? Do all the segments of the LCD display illuminate for 1 to 2 seconds and then display the hours of operation?

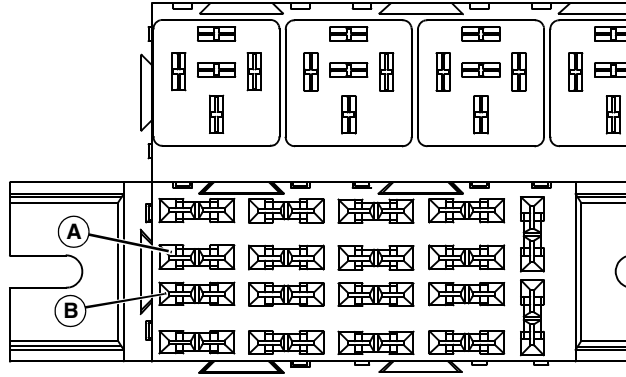
YES: Display panel is operational. Switched power circuit is functional. Go to next step.

NO: Check test conditions. Repeat test. Check unswitched power circuits. If ok, check individual circuits.

Continued on next page

KN52281,10043C7 -19-21JAN13-17/42

Step 2



LVAL11955 —UN—12NOV10

A—Terminal, 072C Red Wire
B—Terminal, 212C Red Wire

Remove F7 and F11 fuses. Are fuses ok? Is battery voltage present at F7 and F11 fuses, 072C (A) and 212C (B) Red wires?

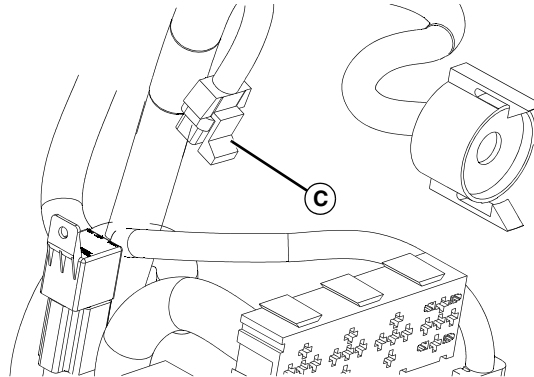
YES: Install F7 and F11 fuses. Go to next step.

NO: Replace fuse(s).

NO: Test key switch. Check 072, and 212 Red wires and connections.

KN52281,10043C7 -19-21JAN13-18/42

Step 3



LVAL11956 —UN—12NOV10

C—X4 Connector

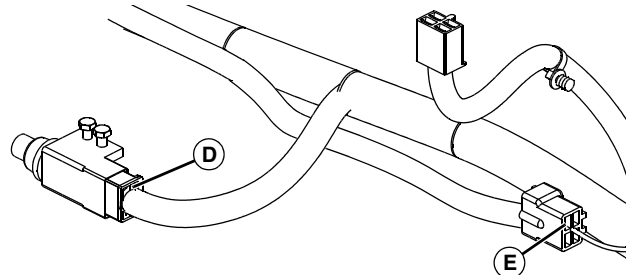
Disconnect X4 connector (C). Is battery voltage present at terminal A, 552B Red wire?

YES: Connect the X4 connector. Go to next step.

NO: Check the 552 Red wires and connections.

KN52281,10043C7 -19-21JAN13-19/42

Step 4



LVAL11957 —UN—12NOV10

D—S15 Brake Switch Connector Terminal B, 552C Red Wire
E—S15 Brake Switch Connector Terminal D, 247A Pur Wire

Is battery voltage present at S15 brake switch, terminal B, 552C Red wire (D)?

YES: Go to next step.

NO: Check the 552 and 552C Red wires and connections.

Continued on next page

KN52281,10043C7 -19-21JAN13-20/42

Step 5

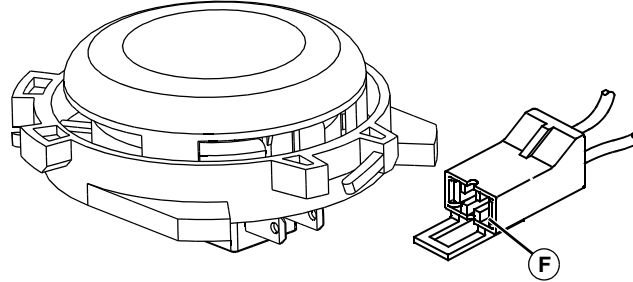
Is battery voltage present at X4 (C) connector (new models), terminal F, 247A Pur wire?

YES: Go to next step.

NO: Test brake switch.
Check the 247 Pur wire and connections.

KN52281,10043C7 -19-21JAN13-21/42

Step 6



LVAL11958 —UN—12NOV10

F—S8 Seat Switch, 562E Red Wire

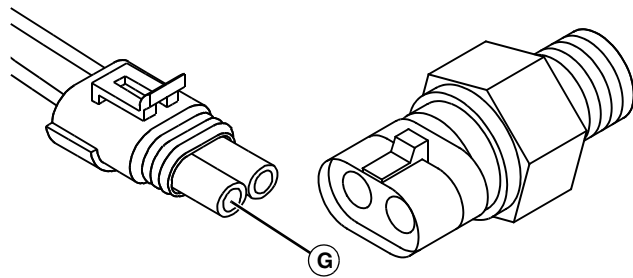
Is battery voltage present at the S8 seat switch, 562E Red wire (F)?

YES: Go to next step.

NO: Check the 562 Red wires.

KN52281,10043C7 -19-21JAN13-22/42

Step 7



LVAL11959 —UN—12NOV10

G—S7 Rear (540) PTO Sensing Switch, 562M Red Wire

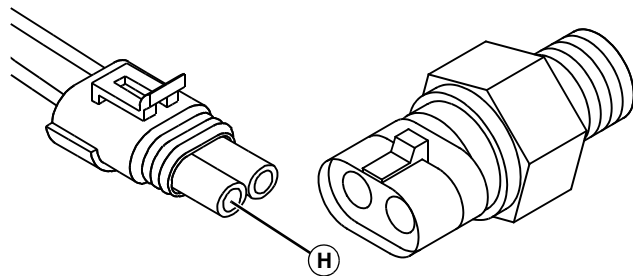
Is battery voltage present at the S7 Rear (540) PTO sensing switch, 562M Red wire (G)?

YES: Go to next step.

NO: Check the 562 Red wires.

KN52281,10043C7 -19-21JAN13-23/42

Step 8



LVAL11960 —UN—12NOV10

H—S10 MFWD Engagement Sensing Switch, 562K Red Wire

Is battery voltage present at the S10 MFWD engagement sensing switch, 562K Red wire (H)?

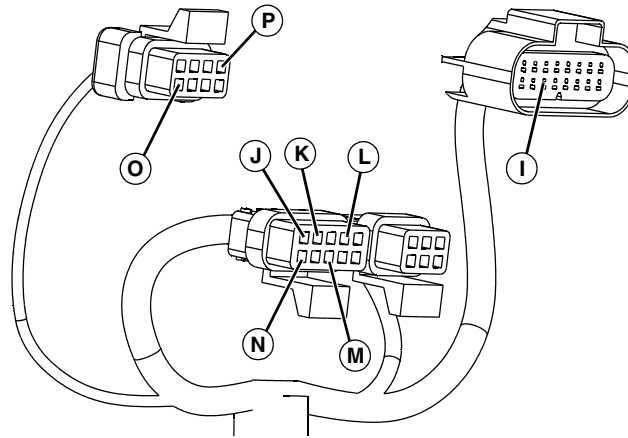
YES: Go to next step.

NO: Check the 562 Red wires.

Continued on next page

KN52281,10043C7 -19-21JAN13-24/42

Step 9



LVAL38939 —UN—27NOV12

I— X7 Connector Terminal P, 050E Blk Wire
 J— X10 Connector Terminal A, 562H Red Wire
 K—X10 Connector Terminal B, 519 Wht Wire
 L—X10 Connector Terminal D, 122E Red Wire
 M—X10 Connector Terminal H, 122D Red Wire
 N—X10 Connector Terminal K, 586A Blu Wire
 O—X11 Connector Terminal H, 050D Blk Wire
 P—X11 Connector Terminal D, 594A Yel Wire

Is continuity to ground present at X7 connector terminal P, 050E Blk wire (I)?

YES: Connect X7 connector. Go to next step.

NO: Check 050 Blk wires and connections.

KN52281,10043C7 -19-21JAN13-25/42

Step 10

Disconnect X10 connector to the display panel. Is battery voltage present at terminals A, 562H Red (J); B, 519 Wht (K); D, 122E Red (L); H, 122D Red (M); and K, 586A Blu (N) wires?

YES: Connect X10 connector. Go to next step.

NO: No voltage present at 562H Red wire. Test 562 Red wires and connections.

NO: No voltage present at 519 Wht wire. Test transmission neutral switch (PRT), or that jumper plug is in place on X9 connector (eHydro™). Check 519 Wht wire and connections.

NO: No voltage present at 122E Red wires. Check F5 fuse or unswitched power circuit.

NO: No voltage present at 586A Blu wire. Test park brake switch. Check 586A Blu wire and connections.

Continued on next page

KN52281,10043C7 -19-21JAN13-26/42

Step 11

Disconnect X11 connector to the display panel. Is battery voltage present at terminal D, 594A Yel (P) wire?

YES: Go to next step.

NO: No voltage present at 594A Yel wire. Test mid PTO switch (optional), or that jumper plug is in place on X8 connector. Check 594A Yel wire and connections.

KN52281,10043C7 -19-21JAN13-27/42

Step 12

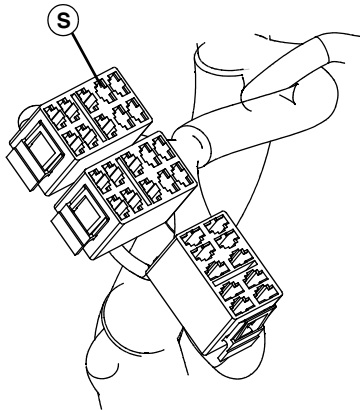
Is continuity to ground present at terminal H, 050D Blk wire (O)?

YES: Connect X11 connector. Go to next step.

NO: Check 050D and 050A Blk wires and connections.

KN52281,10043C7 -19-21JAN13-28/42

Step 13



LVAL11962 —UN—12NOV10

S—S5 Display Mode Switch Connector, 562G Red Wire

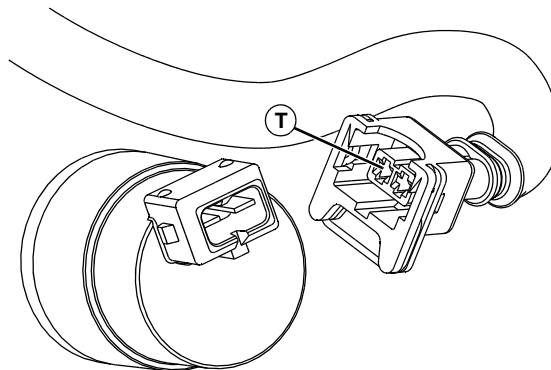
Disconnect the S5 display mode switch. Is battery voltage present at display mode switch connector 562G Red wire (Q)?

YES: Connect display mode switch. Go to next step.

NO: Check the F7 fuse. Check the 562 Red wires.

KN52281,10043C7 -19-21JAN13-29/42

Step 14



LVAL11963 —UN—12NOV10

T—B1 Air Filter Restriction Switch Connector, 562C Red Wire

Disconnect the air filter restriction switch. Is battery voltage present at B1 air filter restriction switch connector 562C Red wire (T)?

YES: Connect the air filter restriction switch.

NO: Check the 562 Red wires.

Continued on next page

KN52281,10043C7 -19-21JAN13-30/42

Step 15

Is battery voltage present at S21 front PTO switch, 562X Red wire and 733 Org wire?

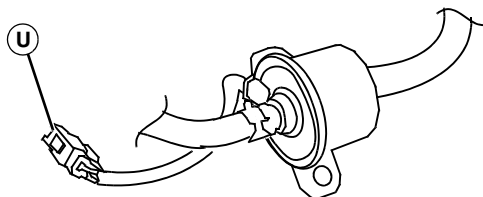
YES: Go to next step.

NO: 562X Red wire—Check 562 Red wires and connections.

NO: 733 Org wire—Ensure that front PTO switch is off. Test front PTO switch.

KN52281,10043C7 -19-21JAN13-31/42

Step 16



LVAL11964 —UN—12NOV10

U—M2 Fuel Pump Connector, 562F Red Wire

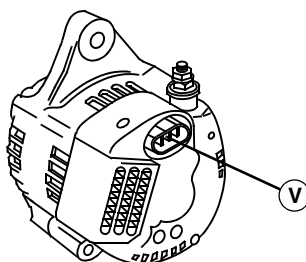
Is battery voltage present at 562F Red wire (U) of M2 fuel pump?

YES: Go to next step.

NO: Check 562 Red wires and connections.

KN52281,10043C7 -19-21JAN13-32/42

Step 17



LVAL11965 —UN—12NOV10

V—G2 Alternator, 072A Red Wire

Is battery voltage present at G2 alternator, 072A Red wire (V)?

YES: Test complete.

NO: Check 072 Red wires and connections.

KN52281,10043C7 -19-21JAN13-33/42

Test Procedure C

Test Conditions

- Key switch in run position, engine not running.
- Transmission in neutral (PRT).
- PTO(s) off.
- Brakes off.

- Park brake locked.
- MFWD disengaged.
- Operator off seat.
- Light switch off.
- Hazard light switch off.
- Turn signal switch off.

KN52281,10043C7 -19-21JAN13-34/42

Secondary Switched Power Circuits

Continued on next page

KN52281,10043C7 -19-21JAN13-35/42

Step 1

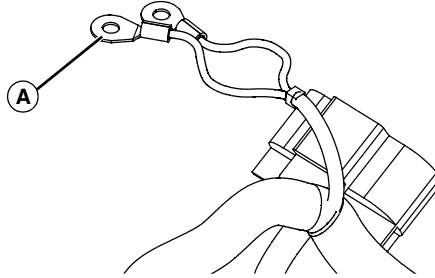
Remove K1 fuel relay. Is battery voltage present at K1 fuel relay terminal 86, 304A Yellow wire?

YES: Install fuel relay. Go to next step.

NO: Check that test conditions are met. Check 304A Yellow wire and connections. If ok, replace display panel.

KN52281,10043C7 -19-21JAN13-36/42

Step 2



LVAL11966 —UN—12NOV10

A—B4 Fuel Gauge Sensor, 353A Org Wire

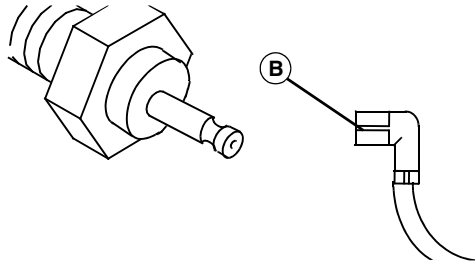
Is battery voltage present at B4 fuel gauge sensor, 353A Org wire (A)?

YES: Go to next step.

NO: Check 353A Org wire and connections. If ok, and test conditions are correct, replace display panel.

KN52281,10043C7 -19-21JAN13-37/42

Step 3



LVAL11967 —UN—12NOV10

B—B3 Engine Coolant Temperature Sensor, 359A Wht Wire

Is battery voltage present at B3 engine coolant temperature sensor, 359A Wht wire (B)?

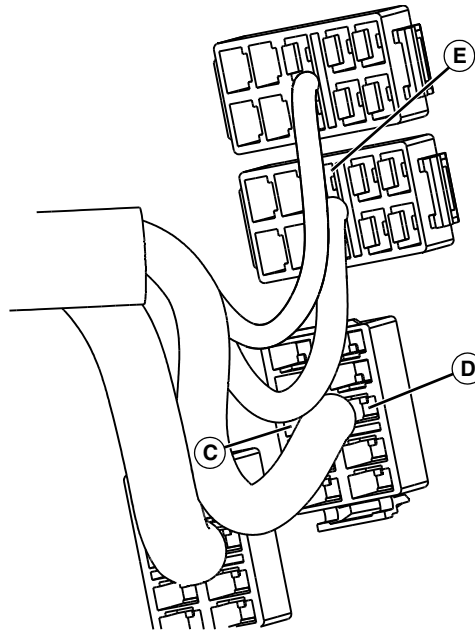
YES: Go to next step.

NO: Check 359A Wht wire and connections. If ok, and test conditions are correct, replace display panel.

Continued on next page

KN52281,10043C7 -19-21JAN13-38/42

Step 4



LVAL11968 —UN—12NOV10

C—S13 Hazard Lights Switch Connector Terminal 2, 102 Red Wire
D—S13 Hazard Lights Switch Connector Terminal 5, 127B Pur Wire
E—S14 Turn Signal Switch Connector Terminal 2, 127A Pur Wire

With the S13 hazard lights switch connected, is battery voltage present at hazard lights switch connector terminal 2, 102 Red wire (C)?

YES: Go to next step.

NO: Test hazard lights switch.

KN52281,10043C7 -19-21JAN13-39/42

Step 5

Is battery voltage present at S13 hazard lights switch connector terminal 5, 127B Pur wire (D)?

YES: Go to next step.

NO: Test flasher relay.
 Check the 127C and 127B Pur wires.

KN52281,10043C7 -19-21JAN13-40/42

Step 6

Is battery voltage present at S14 turn signal switch connector terminal 2, 127A Pur wire (E)?

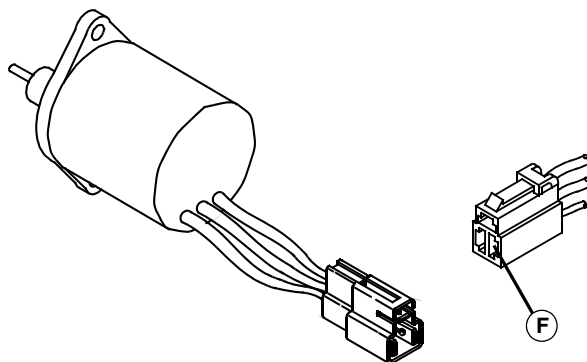
YES: Go to next step.

NO: Check the 127C and 127A Pur wires.

KN52281,10043C7 -19-21JAN13-41/42

Continued on next page

Step 7



LVAL11969 —UN—12NOV10

F—Y2 Fuel Shutoff Solenoid, 302 Red Wire

Is battery voltage present at Y2 fuel shutoff solenoid, 302 Red wire (F)?

YES: Test complete.

NO: Check that test conditions are met. Check 302 Red wire and connections. If ok, replace display panel.

KN52281,10043C7 -19-21JAN13-42/42

Cranking Circuit Operation

Function:

To energize the starting motor solenoid and engage the starting motor to crank the engine.

Operating Conditions:

- Key switch in start position
- Transmission in neutral
- Rear PTO off
- Front PTO off

Theory of Operation:

⚠ CAUTION: Avoid Injury! ALWAYS engage park brake when starting the engine.

The starting circuit is controlled through the A1 display panel based upon "IF" "THEN" logic. If the operating conditions are met, then the display panel will supply an output signal to the K2 start relay.

The power circuit provides unswitched (122 Red wires), and switched (562 Red wire) to the display panel through X10 connector. This energizes the display panel.

The display panel will supply an output to 518 Gry wire to energize the K2 start relay when it receives input from the S1 key switch (start position) at wire 572 Red, and the S4 rear PTO switch (off position) at wire 573 Org of the X7 connector; the S11 transmission neutral switch (neutral position) at wire 519 Wht, and the G2 alternator (engine rpm less than 400) at wire 325B Grn of the X10 connector; and the S21 front PTO switch (off position) at wire 733 Org of the X11 connector.

When placed in the start position, the key switch provides power to the 572B Red wire which splices to the 572A and

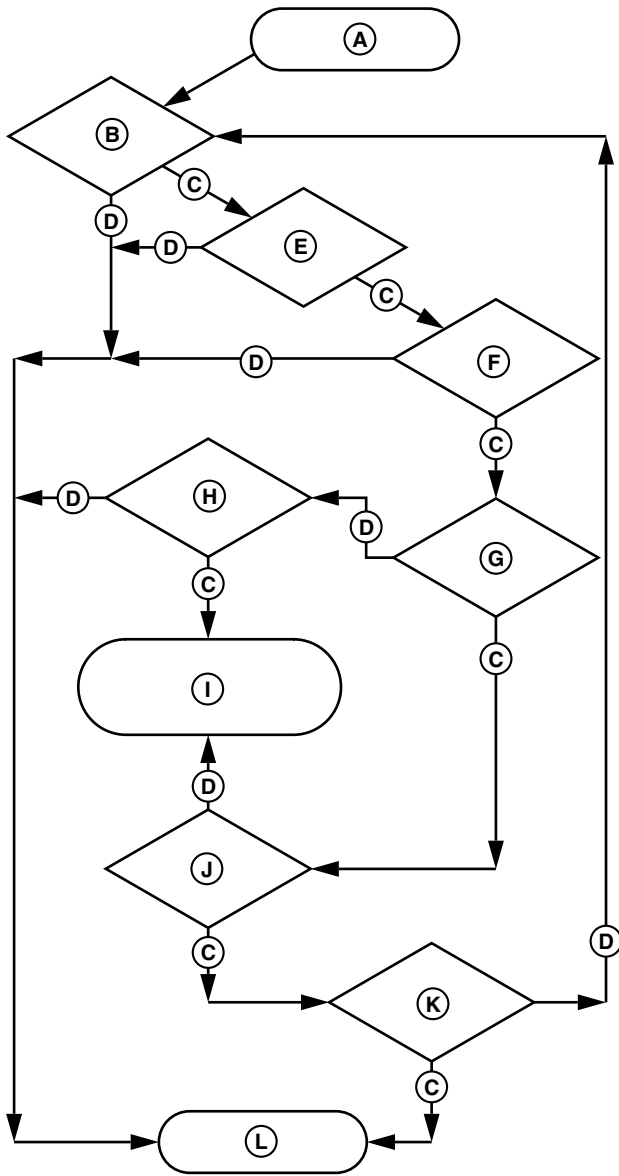
572C Red wires. The 572A Red wires supplies the input signal to the display while the 572C Red wire supplies power to the 30 terminal of the K2 start relay.

When the operating conditions have been met, the display panel will provide output power on 518 Gry wire to the start relay at terminal 86 for up to 60 seconds per starting attempt. This will energize the start relay to close its contacts to provide power from the 572C Red wire to the 309 Wht wire. The 309 Wht wire connects to the Y1 starting motor solenoid to energize the starting motor solenoid. With the starting motor solenoid energized, the starting motor solenoid contacts close and high current from the battery passes through the battery cable and solenoid contacts to the starting motor. The starting motor cranks the engine.

During the cranking process, the display panel monitors the engine speed from an input from the alternator on the 325B Grn wire. An input on the 325B Grn wire indicates that the engine is turning. If the engine rpm is greater than 400 rpm when the key is placed in the start position to crank the engine, the display will read this as the engine already running and not provide an output signal to the start relay. If, during the cranking function, the engine rpm increases to 800 rpm or greater for 3 consecutive seconds, the display panel will read this as the engine is running and will remove the output signal to the start relay.

The following flow chart is a diagram of the display panel cranking circuit logic.

To allow the engine to start, the fuel shutoff solenoid must have pull-in and hold-in power to energize the fuel shutoff solenoid. (See [Fuel Supply/Engine Shutoff Circuit Operation](#) in Section 50, Group 35.) for a detailed description of the fuel circuit.



LVAL17478 —UN—29APR11

A—Attempt to Start Engine
 B—Transmission in Neutral?
 C—Yes
 D—No
 E—Front/Rear PTOs Off?
 F—Key Switch in Start Position?

G—Start Relay Already Engaged?
 H—Engine Speed < 400 rpm?
 I— Output Signal to Start Relay (maximum 60 seconds)
 J— Engine Speed > 800 rpm?
 K—3 Consecutive Seconds?
 L—No Output Signal to Start Relay

KN52281,100437E -19-07DEC12-2/2

Cranking Circuit Operation—MY13

Function

To energize the starting motor solenoid and engage the starting motor to crank the engine.

Operating Conditions

- Key switch in start position
- Transmission in neutral
- Rear PTO off
- Front PTO off

Theory of Operation

⚠ CAUTION: Avoid Injury! ALWAYS engage park brake when starting the engine.

The starting circuit is controlled through the A1 display panel based upon “IF” “THEN” logic. If the operating conditions are met, then the display panel will supply an output signal to the K2 start relay.

The power circuit provides unswitched (122 Red wires), and switched (562 Red wire) to the display panel through X10 connector. This energizes the display panel.

The display panel will supply an output to 518 Gry wire to energize the K2 start relay when it receives input from the S1 key switch (start position) at wire 572 Red, and the S4 rear PTO switch (off position) at wire 573 Org of the X7 connector; the S11 transmission neutral switch (neutral position) at wire 519 Wht, and the G2 alternator (engine rpm less than 400) at wire 325D Grn of the A2 drive controller; and the S21 front PTO switch (off position) at wire 733 Org of the X11 connector.

When placed in the start position, the key switch provides power to the 572B Red wire which splices to the 572A and

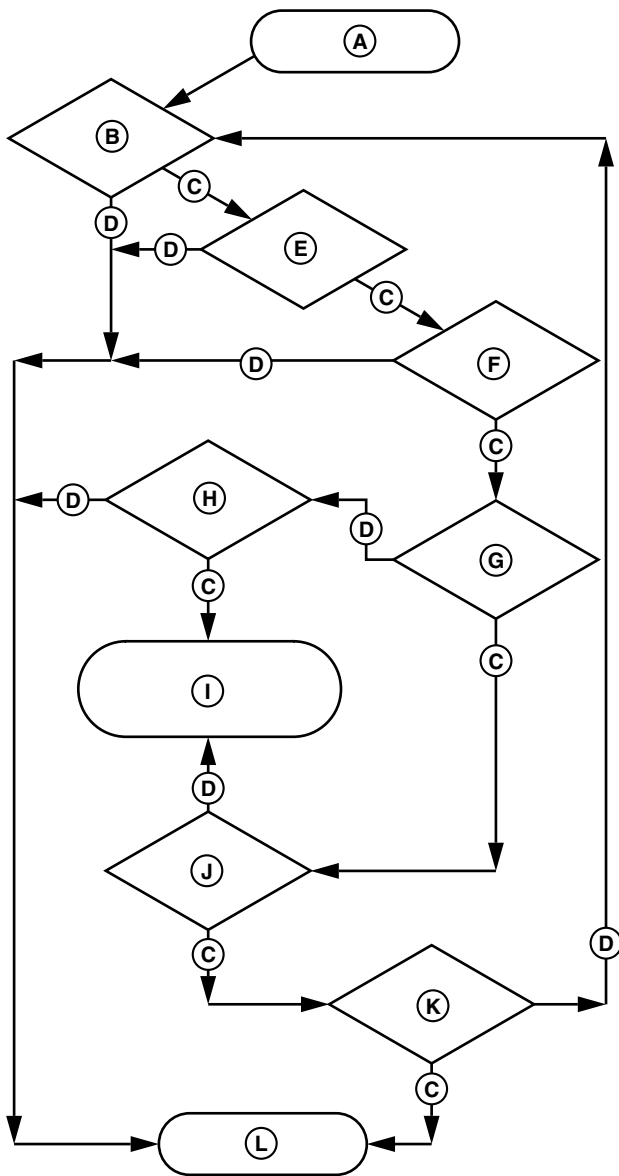
572C Red wires. The 572A Red wires supplies the input signal to the display while the 572C Red wire supplies power to the 30 terminal of the K2 start relay.

When the operating conditions have been met, the display panel will provide output power on 518 Gry wire to the start relay at terminal 86 for up to 60 seconds per starting attempt. This will energize the start relay to close its contacts to provide power from the 572C Red wire to the 309 Wht wire. The 309 Wht wire connects to the Y1 starting motor solenoid to energize the starting motor solenoid. With the starting motor solenoid energized, the starting motor solenoid contacts close and high current from the battery passes through the battery cable and solenoid contacts to the starting motor. The starting motor cranks the engine.

During the cranking process, the display panel monitors the engine speed from an input from the alternator on the 325 Grn wires through A2 drive controller. An input on the 325 Grn wires indicates that the engine is turning. If the engine rpm is greater than 400 rpm when the key is placed in the start position to crank the engine, the display will read this as the engine already running and not provide an output signal to the start relay. If, during the cranking function, the engine rpm increases to 800 rpm or greater for 3 consecutive seconds, the display panel will read this as the engine is running and will remove the output signal to the start relay.

The following flow chart is a diagram of the display panel cranking circuit logic.

To allow the engine to start, the fuel shutoff solenoid must have pull-in and hold-in power to energize the fuel shutoff solenoid. (See [Fuel Supply/Engine Shutoff Circuit Operation](#) in Section 50, Group 35.) for a detailed description of the fuel circuit.



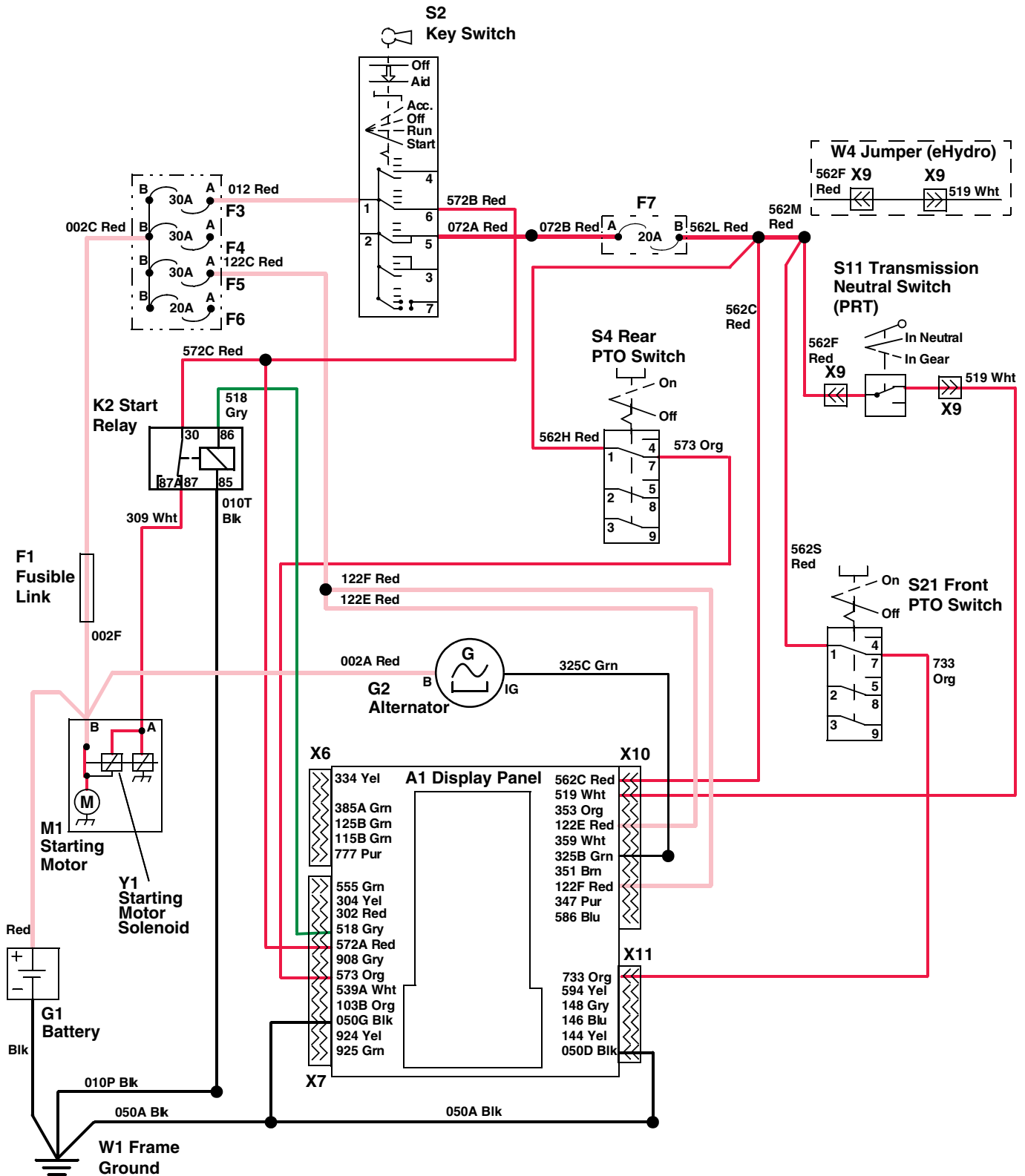
LVAL17478 —UN—29APR11

A—Attempt to Start Engine
 B—Transmission in Neutral?
 C—Yes
 D—No
 E—Front/Rear PTOs Off?
 F—Key Switch in Start Position?

G—Start Relay Already Engaged?
 H—Engine Speed < 400 rpm?
 I— Output Signal to Start Relay (maximum 60 seconds)
 J— Engine Speed > 800 rpm?
 K—3 Consecutive Seconds?
 L—No Output Signal to Start Relay

KN52281,10043C8 -19-11JAN13-2/2

Cranking Circuit Electrical Schematic—Pre MY08



LVAL11971 —UN—12NOV10

Continued on next page

KN52281,100437F -19-01NOV12-1/2

A1—Display Panel
 F1—Fusible Link
 F3—Fuse 30A
 F4—Fuse 30A
 F5—Fuse 30A
 F6—Fuse 20A
 F7—Fuse 20A
 G1—Battery
 G2—Alternator
 K2—Start Relay
 M1—Starting Motor

S2—Key Switch
 S4—Rear PTO Switch
 S11—Transmission Neutral
 Switch (PRT)
 S21—Front PTO Switch
 W1—Frame Ground
 W4—Jumper (eHydro™) Plug
 X6—W1 Main Wiring Harness to
 A1 Display Panel

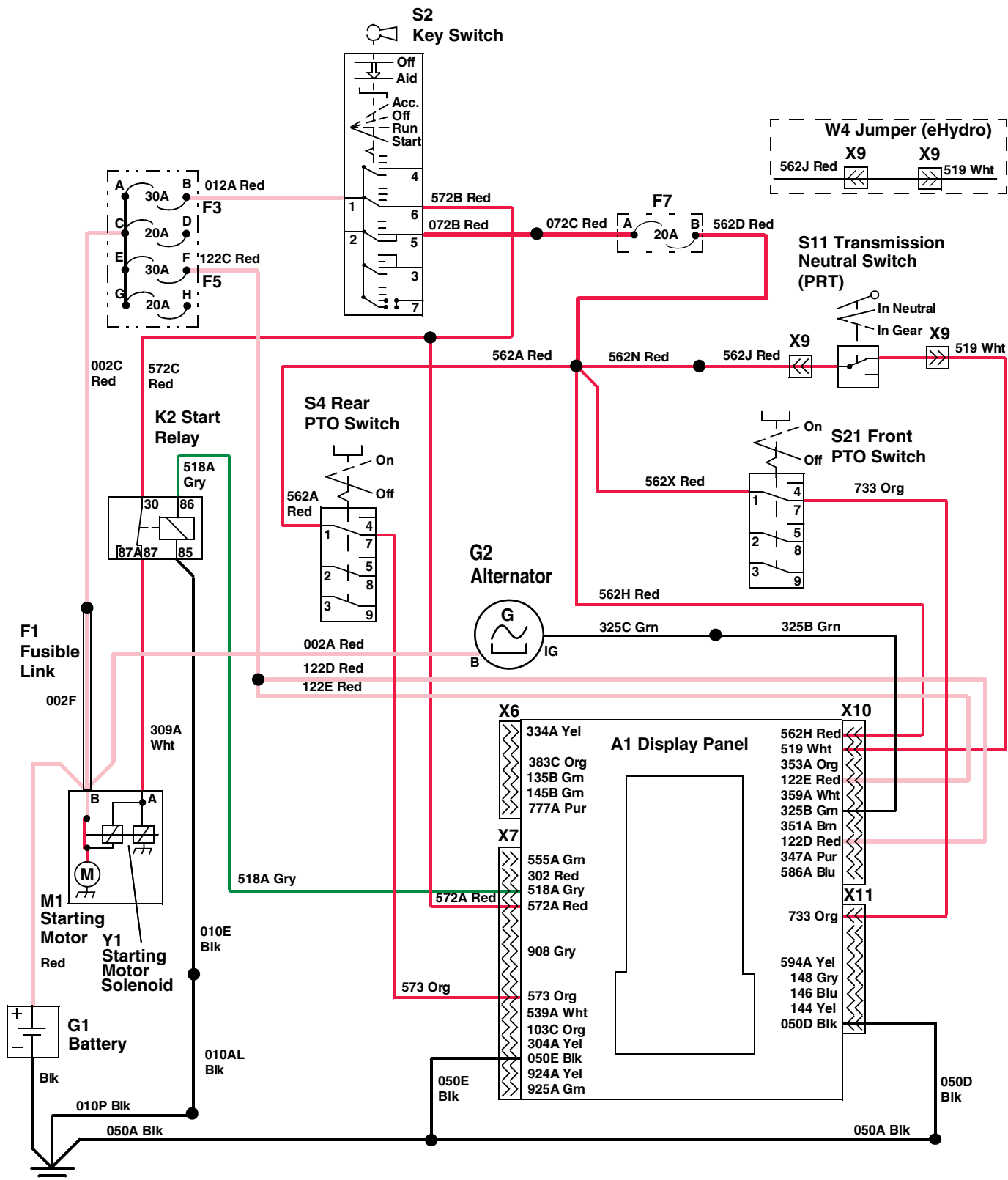
X7—W1 Main Wiring Harness to
 A1 Display Panel
 X9—W1 Main Wiring Harness to
 S11 Transmission Neutral
 Switch (PRT), W4 Jumper
 Plug (eHydro™)

X10—W1 Main Wiring Harness
 to A1 Display Panel
 X11—W1 Main Wiring Harness
 to A1 Display Panel
 Y1—Starting Motor Solenoid

eHydro is a trademark of Deere & Company

KN52281,100437F -19-01NOV12-2/2

Cranking Circuit Electrical Schematic—MY08



LVAL11972 —UN—12NOV10

Continued on next page

KN52281,1004380 -19-23OCT12-1/2

A1—Display Panel
F1—Fusible Link
F3—Fuse 30A
F5—Fuse 30A
F7—Fuse 20A
G1—Battery
G2—Alternator
K2—Start Relay
M1—Starting Motor
S2—Key Switch

S4—Rear PTO Switch
S11—Transmission Neutral
Switch (PRT)
S21—Front PTO Switch
W4—Jumper (eHydro™) Plug
X6—W1 Main Wiring Harness to
A1 Display Panel

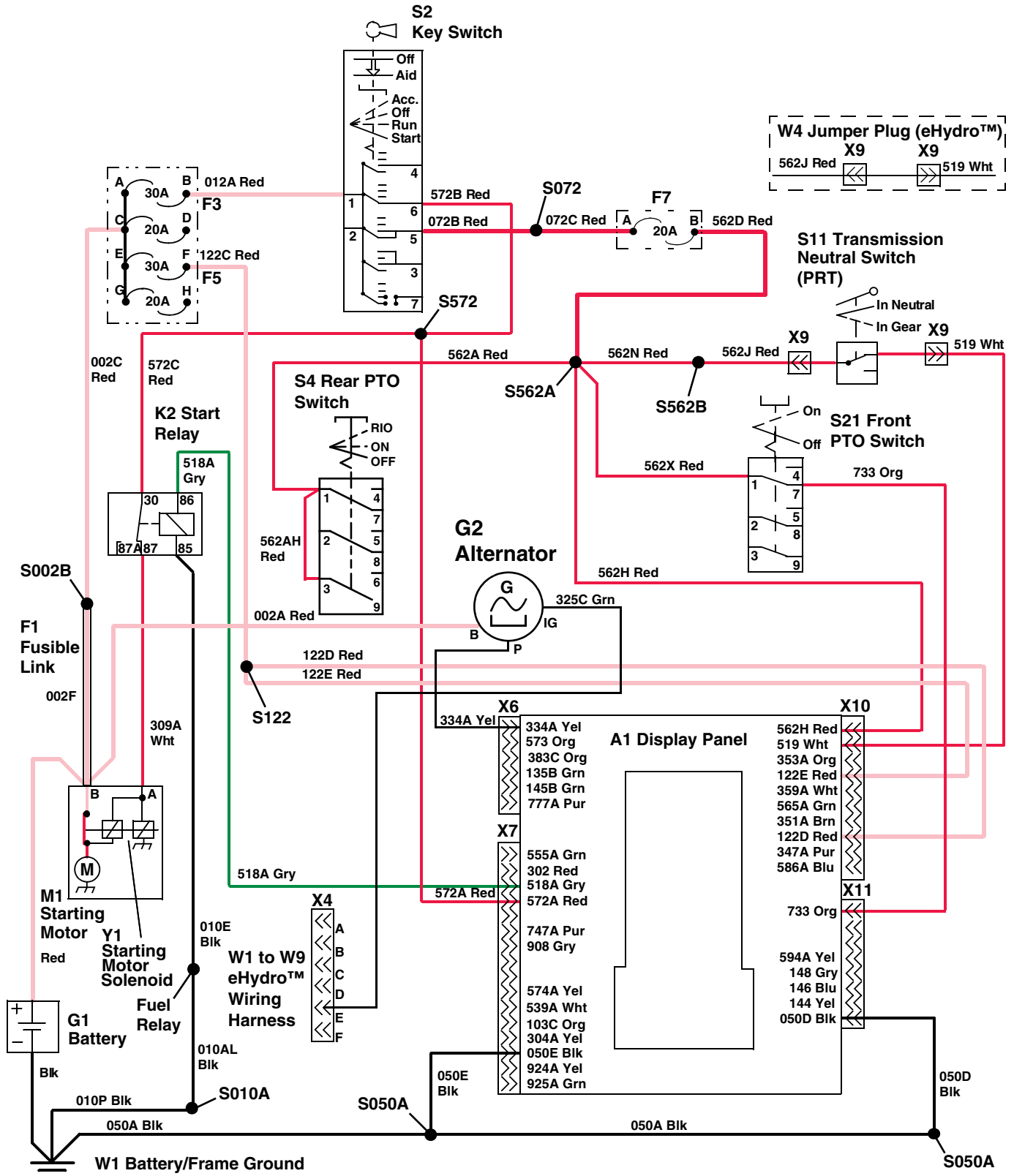
X7—W1 Main Wiring Harness to
A1 Display Panel
X9—W1 Main Wiring Harness to
S11 Transmission Neutral
Switch (PRT), W4 Jumper
Plug (eHydro™)

X10—W1 Main Wiring Harness
to A1 Display Panel
X11—W1 Main Wiring Harness
to A1 Display Panel
Y1—Starting Motor Solenoid

eHydro is a trademark of Deere & Company

KN52281,1004380 -19-23OCT12-2/2

Cranking Circuit Electrical Schematic—MY13



LVAL38882 —UN—15JAN13

Continued on next page

KN52281,10043C9 -19-16JAN13-1/2

A1—Display Panel
F1—Fusible Link
F3—Fuse 30A
F5—Fuse 30A
F7—Fuse 20A
G1—Battery
G2—Alternator
K2—Start Relay
M1—Starting Motor
S2—Key Switch
S4—Rear PTO Switch

S11—Transmission Neutral Switch (PRT)
S21—Front PTO Switch
W4—Jumper Plug
X4—W1 Main Wiring Harness to W9 Wiring Harness
X6—W1 Main Wiring Harness to A1 Display Panel

X7—W1 Main Wiring Harness to A1 Display Panel
X9—W1 Main Wiring Harness to S11 Transmission Neutral Switch (PRT), W4 Jumper Plug (eHydro™)

X10—W1 Main Wiring Harness to A1 Display Panel
X11—W1 Main Wiring Harness to A1 Display Panel
Y1—Starting Motor Solenoid

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KN52281,10043C9 -19-16JAN13-2/2

Cranking Circuit Diagnosis

Fault codes Err72 and Err73 indicate a problem with the output signal on wire 518 Gry or the K2 start relay.

Test Procedure A

Test Conditions:

- Rear PTO off.
- Transmission in neutral (PRT).
- Key switch in the start position.
- Display panel is powered on. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

KN52281,1004381 -19-07DEC12-1/9

Cranking Circuit

KN52281,1004381 -19-07DEC12-2/9

Step 1

NOTE: Relay positions are different between old and new machines. Check machine specific load center arrangements. (See [Load Center—Pre MY08](#) in Section 50, Group 15.) and (see [Load Center—MY08](#) in Section 50, Group 20.)

Is Err72 or Err73 showing on the display panel?

YES: Err72—Short to ground. Test the start relay. Check the 518 Gry wire and connections for a short to ground.

YES: Err73—Short to battery voltage or open circuit. Test the start relay. Check the 518 Gry wire and connections for a short battery voltage or broken wire or connection.

NO: Go to next step.

KN52281,1004381 -19-07DEC12-3/9

Step 2

The starting motor does not function and there is battery voltage present at the starting motor solenoid A terminal?

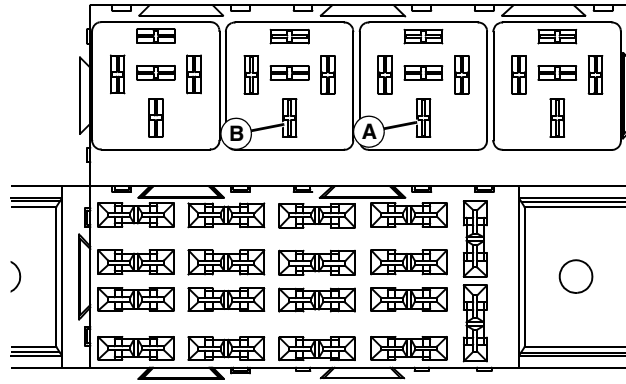
YES: Test starting motor solenoid and starting motor. Repair or replace as needed.

NO: Test start relay. Check 309 Wht wire and connections. Check 010 wires to ground. Go to next step.

Continued on next page

KN52281,1004381 -19-07DEC12-4/9

Step 3



LVAL11973 —UN—12NOV10

A—K2 Start Relay Terminal 30, 572C Red Wire (older models)

B—K2 Start Relay Terminal 30, 572C Red Wire (new models)

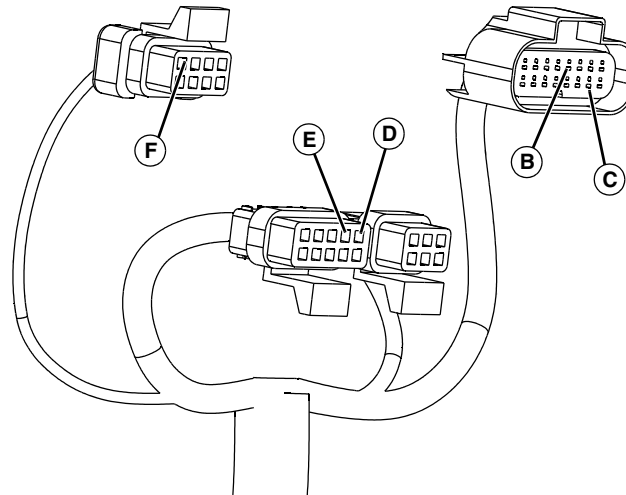
Remove K2 start relay. Is battery voltage present at K2 start relay terminal 30, 572C Red wire (A for older models; B for new models) with key switch in the start position?

YES: Install start relay. Go to next step.

NO: Test key switch. Check 572A, 572B, and 572C Red wires and connections.

KN52281,1004381 -19-07DEC12-5/9

Step 4



LVAL11974 —UN—12NOV10

B—X7 Connector Terminal D, 572A Red Wire

C—X7 Connector Terminal K, 573 Org Wire

D—X10 Connector Terminal A, 562 Red Wire

E—X10 Connector Terminal B, 519 Wht Wire

F—X11 Connector Terminal A, 733 Org Wire

Disconnect X7 connector from display panel. Is battery voltage present at terminals D, 572A Red (B) wire and K, 573 Org (C) wire with key switch in the start position?

YES: Install X7 connector. Go to next step.

NO: 573 Org wire—Test rear PTO switch. Check 573 Org wire and connections. Test switched power circuit. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

NO: 572A Red wire—Test key switch. Check 572A, 572B, and 572C Red wires and connections.

Continued on next page

KN52281,1004381 -19-07DEC12-6/9

Step 5

Disconnect X10 connector from display panel. Is battery voltage present at terminals A, 562 Red (D) wire and B, 519 Wht (E) wire with key switch in the start position?

YES: Install X10 connector. Go to next step.

NO: 562 Red wire—Test switched power circuit. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

NO: 519 Wht wire—Test transmission neutral switch. Check 519 Wht wire and connections. Test switched power circuit. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

KN52281,1004381 -19-07DEC12-7/9

Step 6

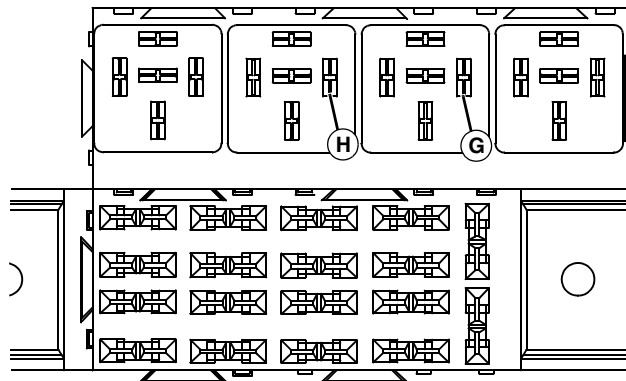
Disconnect X11 connector from display panel. Is battery voltage present at terminal A, 733 Org wire (F) with key switch in the start position?

YES: Install X11 connector. Go to next step.

NO: Test front PTO switch. Check 733 Org wire and connections. Test switched power circuit. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

KN52281,1004381 -19-07DEC12-8/9

Step 7



LVAL11975 —UN—12NOV10

G—K2 Start Relay, 518 Gry Wire (older models)

H—K2 Start Relay, 518 Gry Wire (new models)

Remove K2 start relay. Is battery voltage present at 518 Gry wire (G for older models; H for new models) with key switch in the start position?

YES: Test complete.

NO: Check 518 Gry wire and connections. If ok, replace A1 display panel.

KN52281,1004381 -19-07DEC12-9/9

Cranking Circuit Diagnosis—MY13

Fault codes Err72 and Err73 indicate a problem with the output signal on wire 518A Gry or the K2 start relay.

Test Procedure A

Test Conditions

- Rear PTO off.
- Transmission in neutral (PRT).
- Key switch in the start position.
- Display panel is powered on. (See [Power Circuit Diagnosis](#).)

Continued on next page

AK82585,271AF26 -19-21JAN13-1/9

Cranking Circuit

AK82585,271AF26 -19-21JAN13-2/9

Step 1

NOTE: Relay positions are different between old and new machines. Check machine specific load center arrangements. (See Load Center—Pre MY08.) and (see Load Center—MY08.)

Is Err72 or Err73 showing on the display panel?

YES: Err72—Short to ground. Test the start relay. Check the 518 Gry wire and connections for a short to ground.

YES: Err73—Short to battery voltage or open circuit. Test the start relay. Check the 518 Gry wire and connections for a short battery voltage or broken wire or connection.

NO: Go to next step.

AK82585,271AF26 -19-21JAN13-3/9

Step 2

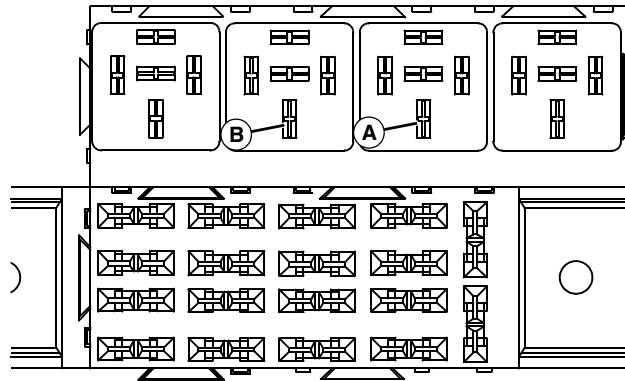
The starting motor does not function and there is battery voltage present at the starting motor solenoid A terminal?

YES: Test starting motor solenoid and starting motor. Repair or replace as needed.

NO: Test start relay. Check 309 Wht wire and connections. Check 010 wires to ground. Go to next step.

AK82585,271AF26 -19-21JAN13-4/9

Step 3



LVAL11973 —UN—12NOV10

A—K2 Start Relay Terminal 30, 572C Red Wire (older models)

B—K2 Start Relay Terminal 30, 572C Red Wire (new models)

Remove K2 start relay. Is battery voltage present at K2 start relay terminal 30, 572C Red wire (A for older models; B for new models) with key switch in the start position?

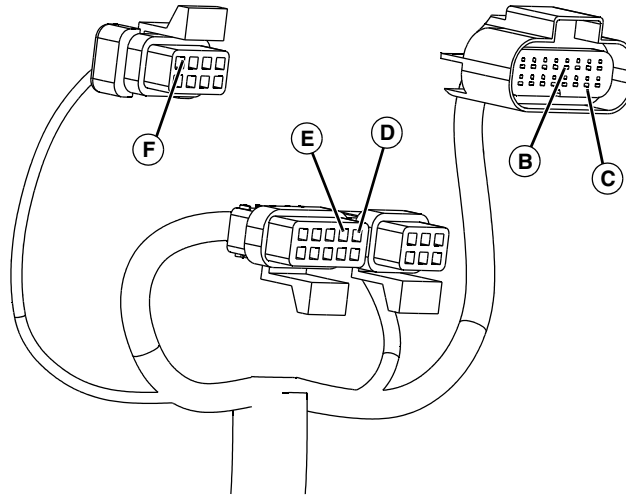
YES: Install start relay. Go to next step.

NO: Test key switch. Check 572A, 572B, and 572C Red wires and connections.

Continued on next page

AK82585,271AF26 -19-21JAN13-5/9

Step 4



LVAL11974 —UN—12NOV10

B—X7 Connector Terminal D, 572A Red Wire
C—X7 Connector Terminal K, 574A Yel Wire
D—X10 Connector Terminal A, 562H Red Wire
E—X10 Connector Terminal B, 519 Wht Wire
F—X11 Connector Terminal A, 733 Org Wire

Disconnect X7 connector from display panel. Is battery voltage present at terminals D, 572A Red (B) wire with key switch in the start position?

YES: Install X7 connector.
Go to next step.

NO: 572A Red wire—Test key switch. Check 572A, 572B, and 572C Red wires and connections.

AK82585,271AF26 -19-21JAN13-6/9

Step 5

Disconnect X10 connector from display panel. Is battery voltage present at terminals A, 562 Red (D) wire and B, 519 Wht (E) wire with key switch in the start position?

YES: Install X10 connector.
Go to next step.

NO: 562 Red wire—Test switched power circuit. (See [Power Circuit Diagnosis.](#))

NO: 519 Wht wire—Test transmission neutral switch. Check 519 Wht wire and connections. Test switched power circuit. (See [Power Circuit Diagnosis.](#))

AK82585,271AF26 -19-21JAN13-7/9

Step 6

Disconnect X11 connector from display panel. Is battery voltage present at terminal A, 733 Org wire (F) with key switch in the start position?

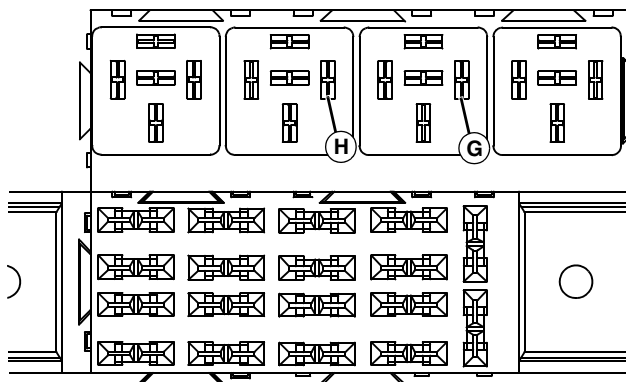
YES: Install X11 connector.
Go to next step.

NO: Test front PTO switch. Check 733 Org wire and connections. Test switched power circuit. (See [Power Circuit Diagnosis.](#))

Continued on next page

AK82585,271AF26 -19-21JAN13-8/9

Step 7



LVAL11975 —UN—12NOV10

G—K2 Start Relay, 518 Gry Wire (older models)

H—K2 Start Relay, 518 Gry Wire (new models)

Remove K2 start relay. Is battery voltage present at 518 Gry wire (G for older models; H for new models) with key switch in the start position?

YES: Test complete.

NO: Check 518 Gry wire and connections. If ok, replace A1 display panel.

AK82585,271AF26 -19-21JAN13-9/9

Manifold Heater and Indicator Light Circuit Operation

Function:

To provide an added source of heat for the combustion chamber during cold starts, especially below **5°C (40°F)** and to illuminate a light on the display panel and indicate to the operator that voltage is being provided to the manifold heater.

Operating Conditions:

- Key switch must be in the start or run position and pushed in to the aid position.

Theory of Operation:

The ignition system is designed to inject diesel fuel into the piston cylinder where heat from compression ignites the fuel and air mixture. When starting a cold engine, compression may not provide enough heat to ignite the fuel. A manifold heater is installed to provide additional heat to the combustion chamber.

The manifold heater is energized (heated) when the key switch is placed in the aid position (key pushed into switch). The key can be pushed into the aid position with the key in either the Start or Run position. The intake manifold may be preheated by pushing in the key, with

the switch in the run position, for up to 3 seconds before turning the key to the start position.

When the key switch is in the aid position, current is provided to the K3 manifold heater relay coil (terminal 86) through the 385 Grn wires. When the relay coil is energized, the relay contacts close and unswitched power (002B Red wire—terminal 30) flows through the contacts and 383 Org wire to the manifold heater.

The engine preheat indicator light in the display panel provides a visual indication that the key is in the aid position and the manifold heater relay is being energized. In this position battery voltage is provided to the engine preheat light through X6 connector (terminal C), and display panel circuit board. A circuit board run provides voltage to the engine preheat light.

In older models the 385A Grn provided power to the X6 connector and indicates that power is being provided to the K3 manifold heater relay coil (terminal 86). In new models (including MY13) the 383C Org wire provides power to the X6 connector and indicates that power is coming out from the K3 manifold heater relay contacts (terminal 87).

A ground circuit path for the display panel circuit board is provided through the X7 and X11 connectors (terminals P and H) and 050 Blk wires.

KN52281,1004382 -19-11JAN13-1/1

A1—Display Panel
F1— Fusible Link
F2— Fusible Link
F3— Fuse 30A
F4— Fuse 30A
F5— Fuse 30A
F6— Fuse 20A
F7— Fuse 20A

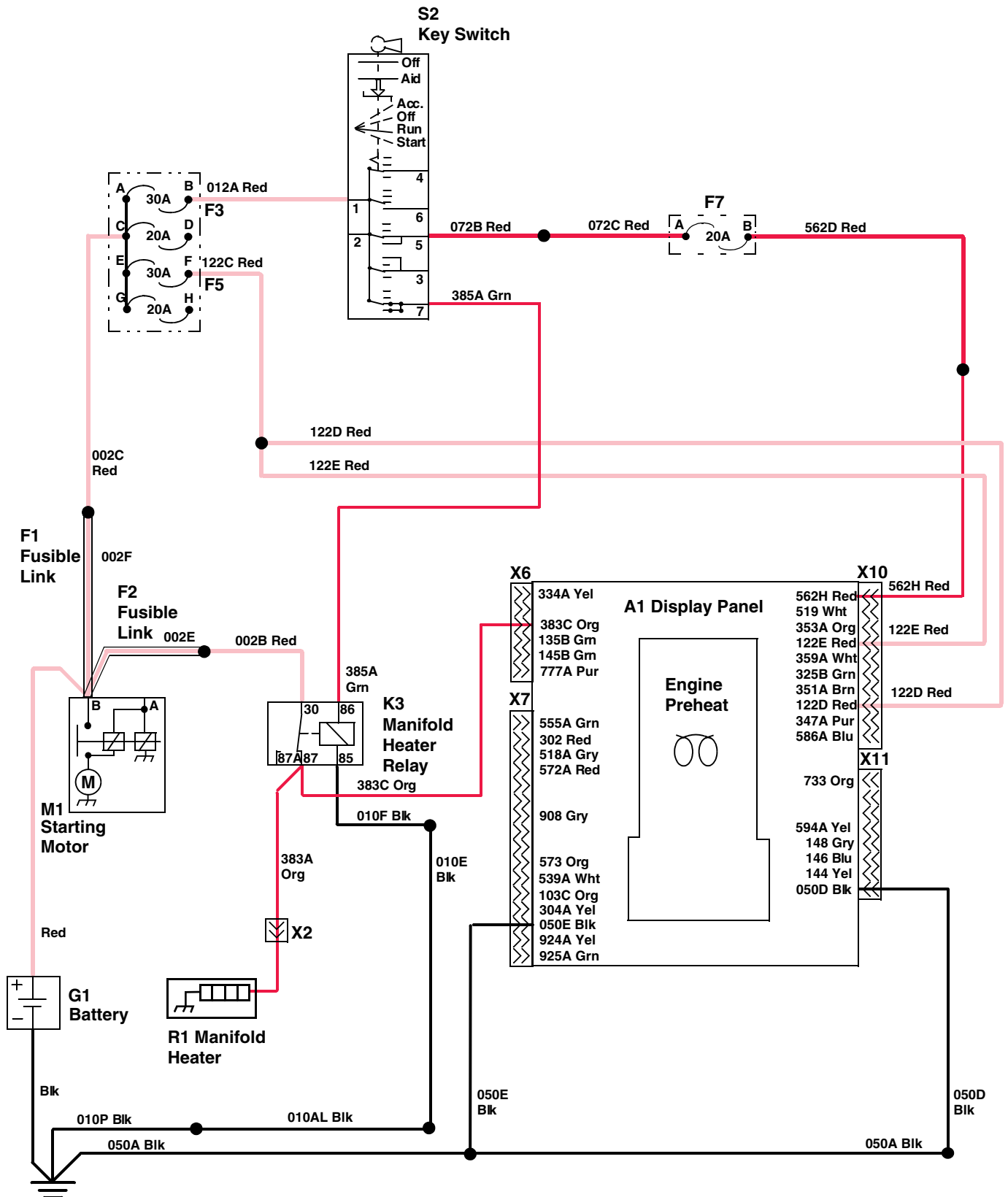
G1—Battery
K3—Manifold Heater Relay
M1—Starting Motor
R1—Manifold Heater
S2— Key Switch
X11— W1 Main Wiring Harness
to A1 Display Panel

W1—Frame Ground
X2— W1 Main Wiring Harness to
R1 Manifold Heater
X6— W1 Main Wiring Harness to
A1 Display Panel
X7— W1 Main Wiring Harness to
A1 Display Panel

X10— W1 Main Wiring Harness
to A1 Display Panel

KN52281,1004383 -19-01NOV12-2/2

Manifold Heater and Indicator Light Circuit Electrical Schematic—MY08



LVAL11977 —UN—12NOV10

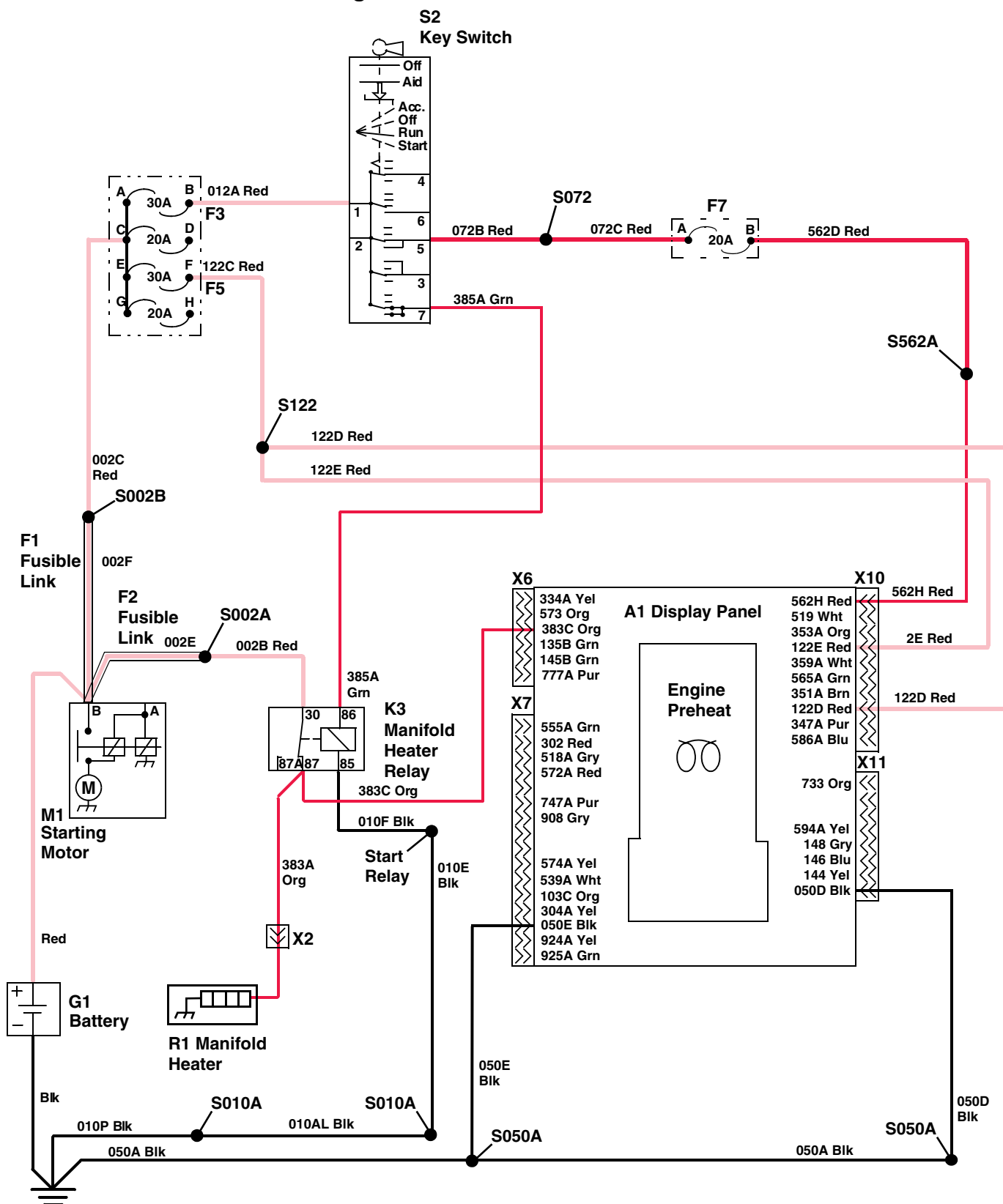
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KN52281,1004384 -19-23OCT12-1/2

A1—Display Panel	K3—Manifold Heater Relay	X6—W1 Main Wiring Harness to	X11— W1 Main Wiring Harness
F1— Fusible Link	M1—Starting Motor	A1 Display Panel	to A1 Display Panel
F2— Fusible Link	R1—Manifold Heater	X7—W1 Main Wiring Harness to	
F3— Fuse 30A	S2— Key Switch	A1 Display Panel	
F5— Fuse 30A	X2—W1 Main Wiring Harness to	X10— W1 Main Wiring Harness	
F7— Fuse 20A	R1 Manifold Heater	to A1 Display Panel	
G1—Battery			

KN52281,1004384 -19-23OCT12-2/2

Manifold Heater and Indicator Light Circuit Electrical Schematic—MY13



LVAL38883 —UN—26NOV12

Continued on next page

KN52281,10043CA -19-24OCT12-1/2

A1—Display Panel
F1—Fusible Link
F2—Fusible Link
F3—Fuse 30A
F5—Fuse 30A
F7—Fuse 20A
G1—Battery

K3—Manifold Heater Relay
M1—Starting Motor
R1—Manifold Heater
S2—Key Switch
X2—W1 Main Wiring Harness to
R1 Manifold Heater

X6—W1 Main Wiring Harness to
A1 Display Panel
X7—W1 Main Wiring Harness to
A1 Display Panel
X10—W1 Main Wiring Harness
to A1 Display Panel

X11—W1 Main Wiring Harness
to A1 Display Panel

KN52281,10043CA -19-24OCT12-2/2

Manifold Heater and Indicator Light Circuit Diagnosis

Test Procedure A

Test Conditions:

- Key switch in the run position, engine not running.
- Key switch pushed in to the aid position.
- Display panel is powered on. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

KN52281,1004385 -19-11JAN13-1/7

Manifold Heater Circuit

KN52281,1004385 -19-11JAN13-2/7

Step 1

Disconnect X2 connector to the manifold heater. Is battery voltage present at X2 connector, 383 Org wire and is the engine preheat light illuminated?

YES: Connect X2 connector.

YES: Engine preheat light circuit is functional.

NO: Engine preheat light—Go to step 5.

KN52281,1004385 -19-11JAN13-3/7

Step 2

NOTE: Relay positions are different between old and new machines. Check machine specific load center arrangements. (See [Load Center—Pre MY08](#) in Section 50, Group 15.) and (see [Load Center—MY08](#) in Section 50, Group 20.)

Remove K3 manifold heater relay. Is battery voltage present at K3 manifold heater relay terminal 30, 002B Red wire?

YES: Go to next step.

NO: Test power circuit. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

KN52281,1004385 -19-11JAN13-4/7

Step 3

Is battery voltage present at K3 manifold heater relay terminal 86, 385 Grn wire?

YES: Go to next step.

NO: Test key switch. Check 385 Grn wires and connections.

KN52281,1004385 -19-11JAN13-5/7

Step 4

Is continuity to ground present at K3 manifold heater relay terminal 85, 010 Blk wire?

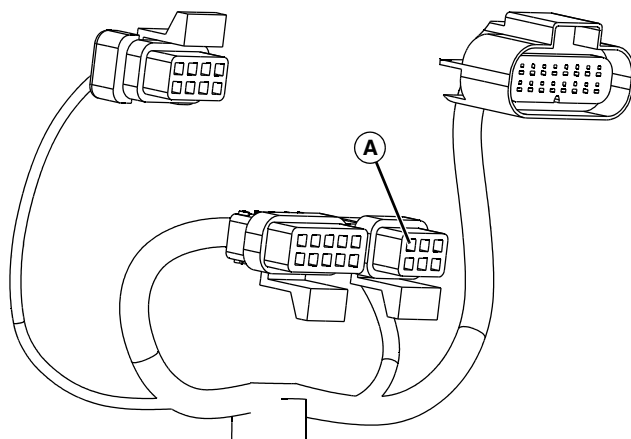
YES: Install manifold heater relay. Go to next step.

NO: Check 010 Blk wires and connections.

Continued on next page

KN52281,1004385 -19-11JAN13-6/7

Step 5



LVAL11978 —UN—12NOV10

A—X6 Connector Terminal C, 385A Grn Wire

Disconnect X6 connector at the display panel. Is battery voltage present at X6 connector, terminal C, 385A Grn wire (A) on older machines, or X6 connector, terminal C, 383C Org wire (A) on newer machines?

YES: Check for continuity to ground at A1 display panel 050 Blk wires. If ok, replace display panel.

NO: Older machines: Check 385A, 385B and 385C Grn wires and connections.

NO: Newer machines: Test K3 relay. Check 383C Org wire and connections.

KN52281,1004385 -19-11JAN13-7/7

Fuel Supply/Engine Shutoff Circuit Operation

Function:

To start or stop the supply of fuel to the engine.

To cut power to the fuel shutoff solenoid and stop the machine engine when desired or in an unsafe operating condition.

Operating Conditions (Cranking):

- PTO(s) off,
- Transmission in neutral (PRT), and
- Key switch in the start position.

Operating Conditions (Engine on, Operator ON Seat):

- Key switch in the run position,
- Operator on seat,
- PTO(s) off or on, and
- Transmission in any gear (PRT).

Operating Conditions (Engine On, Operator OFF Seat):

- Key switch in the run position,
- Park brake locked,
- Transmission in neutral (PRT),
- PTO(s) off, and then
- Operator may leave seat.

Operating Conditions (Engine On, Operator OFF Seat, Rear PTO Engaged):

- Key switch in the run position,
- Park brake locked,
- Transmission in neutral (PRT),
- Mid PTO off,
- Operator may leave seat, and then
- Rear PTO can be on.

Engine MUST STOP when:

- Operator places the key switch in the off position

or;

- PTO(s) on, and
- Operator gets out of seat (if off seat PTO logic is not engaged),

or (PRT);

- Transmission is in gear, and
- Operator gets out of seat,

Theory of Operation—Fuel Supply Logic:

The fuel system is designed to inject fuel into the piston cylinders where heat from compression ignites the fuel and air mixture. Fuel is provided to the engine when the fuel shutoff solenoid is energized.

A normal higher in-rush current is used to energize the fuel shutoff solenoid pull-in coil and opens the spring loaded fuel valve. Once energized, the current required to operate the fuel shutoff solenoid is provided at a lower rate to hold-in the fuel valve allowing fuel to the engine. The current to the fuel shutoff solenoid pull-in coil is then removed.

This fuel shutoff solenoid pull-in coil circuit causes the display panel to provide power to the fuel relay. The fuel relay will energize, closing its contacts to provide current from the unswitched power circuit wire 002D Red to the 329 Wht wire. This energizes the pull-in coil of the fuel shutoff solenoid.

After a short delay, the display panel will provide an output on the 302 Red wire to the Y2 fuel shutoff solenoid hold-in coil. At the same time, the display panel will remove the output to the K1 fuel relay over the 304 Yel wire.

A ground path for the fuel shutoff solenoid is provided through the 010N and 010P Blk wires.

When the key switch is placed in either the run or start positions, current from the switched power circuit is provided to the A1 display panel through either the S8 seat switch (on seat) or the S4 rear PTO switch (off) and the S11 transmission neutral switch (PRT—neutral).

Fuel is supplied to the engine by the M2 fuel pump over the 562K or 562F Red wire when the S1 key switch is placed in either the start or run position. Ground for this circuit is through the 010 Blk wires.

Theory of Operation—Engine Shutoff:

When the operator places the key switch in the off position or if an unsafe condition is created, the engine will stop by having the fuel supply shut off.

The fuel supply is shut off when voltage to the Y2 fuel shutoff solenoid hold-in coil is removed.

Power to the Y2 fuel shutoff solenoid pull-in and hold-in coils (and K1 fuel relay) is the result of an output from the A1 display panel, and is controlled by several different input circuits. The different input circuits allow for a variety of operating conditions to exist and maintain fuel supply to the engine.

Engine on, Operator ON Seat Logic:

The seat switch is the main and most direct circuit to provide input to the A1 display panel that will provide an output to the K1 fuel relay coil.

This on seat logic circuit provides voltage to the fuel relay for normal operator on seat use of the machine.

Power is provided through the key switch, 072 Red wires, F7 fuse, 562 Red wires, S8 seat switch (operator on seat), and 539 Wht wires to the A1 display panel (X7 connector, terminal L).

The display panel will then provide an output on the 304 Yel wire to energize the K1 fuel relay and close its contacts. This in turn will provide voltage to the Y2 fuel shutoff solenoid pull-in coil.

After a short delay, the display panel will provide an output on the 302 Red wire to the Y2 fuel shutoff solenoid hold-in coil. At the same time, the display panel will remove the output to the K1 fuel relay over the 304 Yel wire.

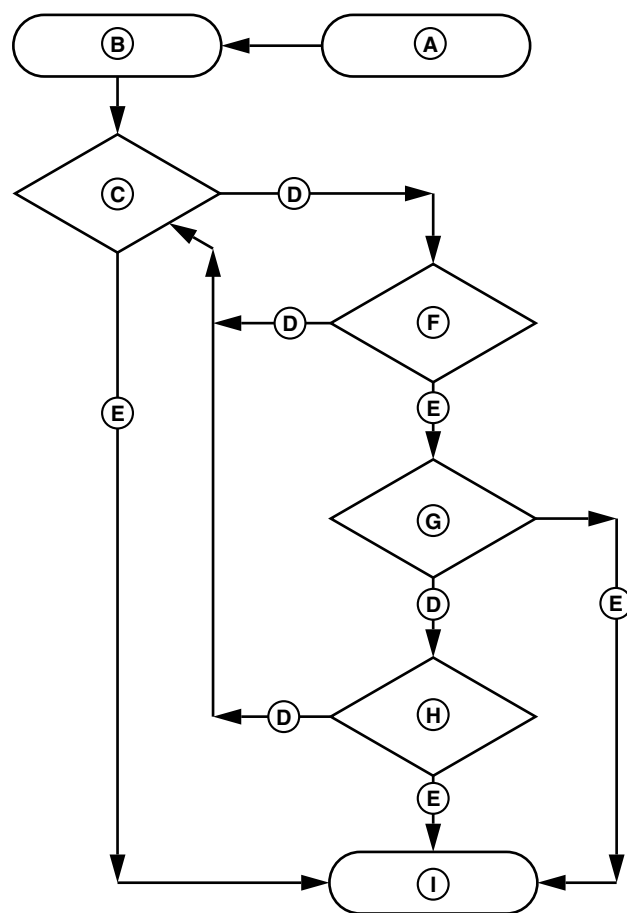
Engine On, Operator OFF Seat Logic:

The S4 rear PTO switch in combination with the S11 transmission neutral switch (PRT), or W4 jumper (eHydro™), is a second path to provide power to the K1 fuel relay coil.

The rear PTO switch, in combination with the transmission neutral switch (PRT), or W4 jumper (eHydro™), provides power to the fuel circuit. Power is provided from the key switch to the 072 Red wires, F7 fuse, and 562 Red wires.

A 562 Red wire provides power to the S4 rear PTO switch (PTO off), 573 Org wire, and A1 display panel (X7 connector, terminal K).

A 562 Red wire provides power to the S21 front PTO switch (PTO off), 733 Org wire, and A1 display panel (X11 connector, terminal A).



Fuel Supply/Engine Shutoff Circuit Operation Flow Chart

- | | |
|-------------------------------------|----------------------------|
| A—Fuel Solenoid Off | F—Transmission in Neutral? |
| B—Place Key Switch in Run Position. | G—PTOs Off? |
| C—Operator On Seat? | H—Off Seat PTO Logic On? |
| D—No | I— Fuel Solenoid On |
| E—Yes | |

At the same time a 562 Red wire provides power to the S11 transmission neutral switch (PRT) or W4 jumper (eHydro™), 519 Wht wire, and A1 display panel (X10 connector, terminal B).

The display panel will then provide an output on the 304 Yel wire to the K1 fuel relay to energize the relay and close its contacts, if the PTO is off and the transmission is in neutral, without the operator in the seat. This in turn will provide voltage to the Y2 fuel shutoff solenoid pull-in coil.

After a short delay, the display panel will provide an output on the 302 Red wire to the Y2 fuel shutoff solenoid hold-in coil. At the same time, the display panel will remove the output to the K1 fuel relay over the 304 Yel wire, de-energizing the fuel shutoff solenoid pull-in coil.

Engine On, Operator OFF Seat, Front or Rear PTO Engaged Logic (Off Seat PTO Logic):

To operate a machine with the rear PTO engaged and allow the operator to leave the seat requires that the Off Seat PTO Logic be activated. The off seat PTO logic is activated and deactivated automatically as the operator uses different functions of the machine.

To activate the off seat PTO logic the A1 display panel requires proper input signals from the following circuits during the following conditions:

Input Circuit	Operating Condition
Seat switch	Operator on seat,
Rear PTO switch	Off position
Front PTO switch	Off position
Park brake switch	Park brake locked
Transmission neutral switch (PRT), or W4 jumper (eHydro™)	Transmission in neutral
W3 Mid PTO jumper, or optional S9 Mid PTO switch	S9 Mid PTO switch off (if equipped)
Optional S21 front PTO switch	S21 optional front PTO switch off
Alternator	Engine running

Once the off seat PTO logic has been activated, the operator may leave the seat and then engage the front or rear PTO. With the mid PTO engaged, the operator must remain on the seat in order for the engine to remain running.

Except for the seat switch, if any of the other inputs change once the operator has left the seat and engages the front or rear PTO, the engine will shutoff.

If the operator returns to the seat, the engine will continue to run with the front or rear PTO engaged, however the off seat PTO logic will be deactivated and the engine will shutoff if the operator leaves the seat, unless the off seat PTO logic is activated again.

The A1 display panel requires 4 constant and 2 changing inputs to operate the rear PTO with operator off the seat. 5 inputs supply battery voltage and 1 input supplies a frequency signal to the display panel to activate the off

seat PTO logic. The changing inputs are from the seat switch indicating that the operator has left the seat, and the front or rear PTO switch indicating that the operator has engaged the front or rear PTO.

The switched power circuit provides power to the display panel through the following circuits:

- A 562 Red wire provides power to the S11 transmission neutral switch (PRT), or W4 jumper (eHydro™), 519 Wht wire, and A1 display panel (X10 connector, terminal B).
- A 562 Red wire provides power to the S12 park brake switch (park brake locked), 586 Blu wire, and A1 display panel (X10 connector, terminal K).
- A 562 Red wire provides power to the X8 connector, (S9 Mid PTO switch, if equipped), 594 Yel wire, and A1 display panel (X11 connector, terminal D).
- The frequency input is a result of the engine running and is supplied by the G2 alternator from the 325C and 325B Grn wires to the A1 display panel (X10 connector, terminal F).
- The 562E Red wire provides power to the S8 seat switch (operator on seat), 539C and 539A Wht wires, and A1 display panel (X7 connector, terminal L).
- A 562 Red wire provides power to the S4 rear PTO switch (PTO off), 573 Org wire, and A1 display panel (X7 connector, terminal K).
- A 562 Red wire provides power to the S21 front PTO switch (PTO off), 733 Org wire, and A1 display panel (X11 connector, terminal A).

Once the inputs have been established, the operator may leave the seat, removing power from X7 connector, terminal L and engage the front or rear PTO removing power from X7 connector, terminal K (rear) or X11 connector, terminal A (front).

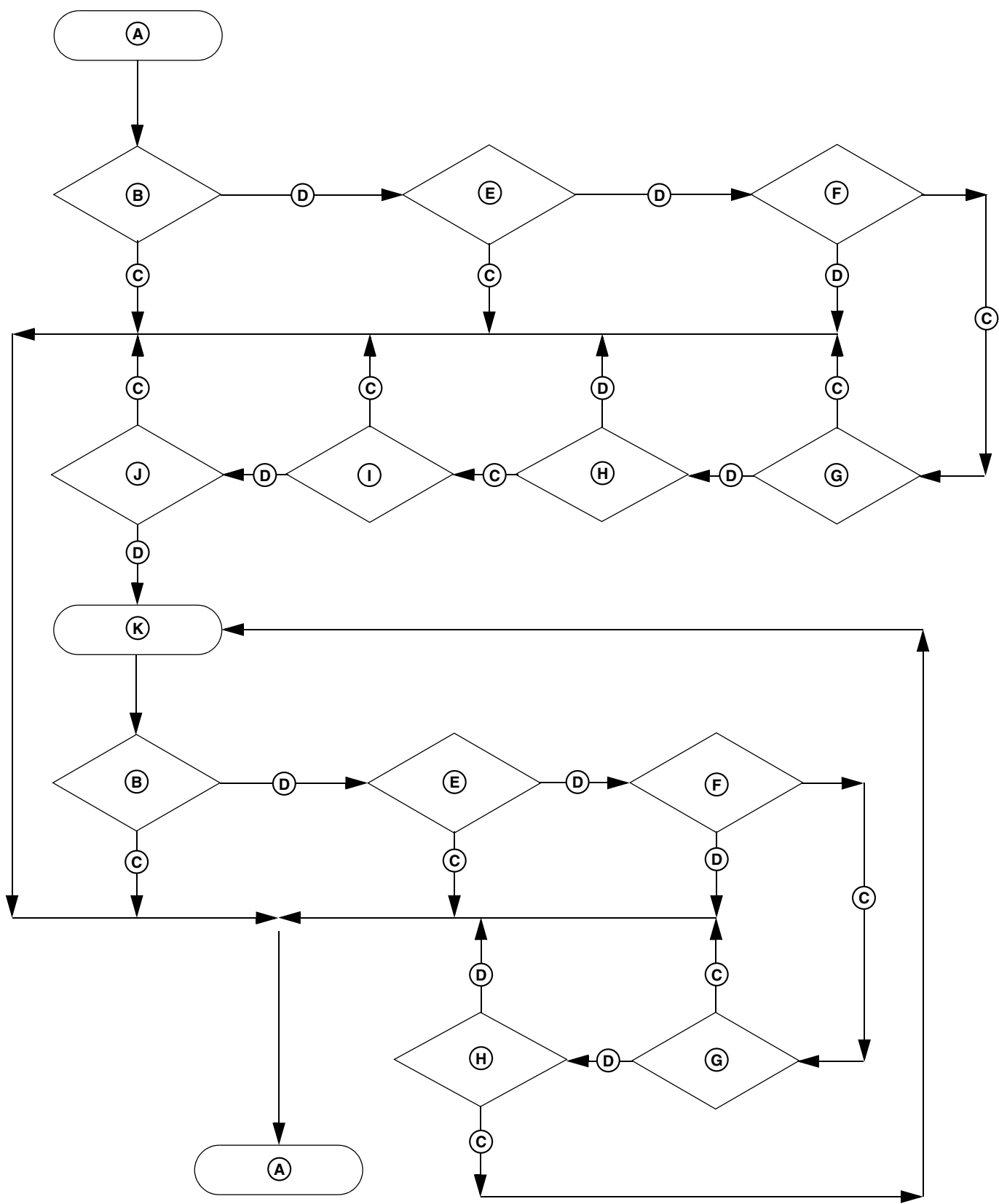
The front or rear PTO will remain engaged until the operator disengages the rear PTO, or unlocks the park brake, or engages the mid PTO, or places the transmission in gear (PRT), or places the key switch in either the off position.

If the operator returns to the seat, the front or rear PTO will remain engaged, however, the off seat PTO logic will be deactivated.

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KN52281,1004386 -19-07DEC12-3/5



LVAL17480 —UN—29APR11

A—Off Seat PTO Logic Off
B—Mid PTO Off?
C—No
D—Yes
E—Park Brake Locked?

F—Operator On Seat?
G—Transmission in Neutral?
H—Engine Crank Signal On?

I— Front/Rear PTOs Off?
J— Engine Cranked at Least
Once?
K—Off Seat PTO Logic On

KN52281,1004386 -19-07DEC12-5/5

Fuel Supply/Engine Shutoff Circuit Operation—MY13

Function

To start or stop the supply of fuel to the engine.

To cut power to the fuel shutoff solenoid and stop the machine engine when desired or in an unsafe operating condition.

Operating Conditions (Cranking)

- PTO(s) off.
- Transmission in neutral (PRT).
- Key switch in the start position.

Operating Conditions (Engine on, Operator ON Seat)

- Key switch in the run position.
- Operator on seat.
- PTO(s) off or on.
- Transmission in any gear (PRT).

Operating Conditions (Engine On, Operator OFF Seat)

- Key switch in the run position.
- Park brake locked.
- Transmission in neutral (PRT).
- PTO(s) off.
- Operator may leave seat.

Operating Conditions (Engine On, Operator OFF Seat, Rear PTO Engaged)

- Key switch in the run position.
- Park brake locked.
- Transmission in neutral (PRT).
- Mid PTO off.
- Operator may leave seat, and then.
- Rear PTO can be on.

Engine MUST STOP when

- Operator places the key switch in the OFF position,

or;

- PTO(s) on, and
- Operator gets out of seat (if off seat PTO logic is not engaged),

or (PRT);

- Transmission is in gear, and
- Operator gets out of seat.

Theory of Operation—Fuel Supply Logic

The fuel system is designed to inject fuel into the piston cylinders where heat from compression ignites the fuel and air mixture. Fuel is provided to the engine when the fuel shutoff solenoid is energized.

A normal higher in-rush current is used to energize the fuel shutoff solenoid pull-in coil and opens the spring loaded

fuel valve. Once energized, the current required to operate the fuel shutoff solenoid is provided at a lower rate to hold in the fuel valve, allowing fuel to the engine. The current to the fuel shutoff solenoid pull-in coil is then removed.

This fuel shutoff solenoid pull-in coil circuit causes the display panel to provide power to the fuel relay. The fuel relay will energize, closing its contacts to provide current from the unswitched power circuit 002D Red wire to the 329 Wht wire. This energizes the pull-in coil of the fuel shutoff solenoid.

After a short delay, the display panel will provide an output on the 302 Red wire to the Y2 fuel shutoff solenoid hold-in coil. At the same time, the display panel will remove the output to the K1 fuel relay over the 304 Yel wire.

A ground path for the fuel shutoff solenoid is provided through the 010N and 010P Blk wires.

When the key switch is placed in either the run or start positions, current from the switched power circuit is provided to the A1 display panel through either the S8 seat switch (on seat) or the S4 rear PTO switch (off) and the S11 transmission neutral switch (PRT—neutral).

Fuel is supplied to the engine by the M2 fuel pump over the 562K or 562F Red wire when the S1 key switch is placed in either the start or run position. Ground for this circuit is through the 010 Blk wires.

Theory of Operation—Engine Shutoff

When the operator places the key switch in the OFF position or if an unsafe condition is created, the engine will stop by having the fuel supply shut off.

The fuel supply is shut off when voltage to the Y2 fuel shutoff solenoid hold-in coil is removed.

Power to the Y2 fuel shutoff solenoid pull-in and hold-in coils (and K1 fuel relay) is the result of an output from the A1 display panel, and is controlled by several different input circuits. The different input circuits allow for a variety of operating conditions to exist and maintain fuel supply to the engine.

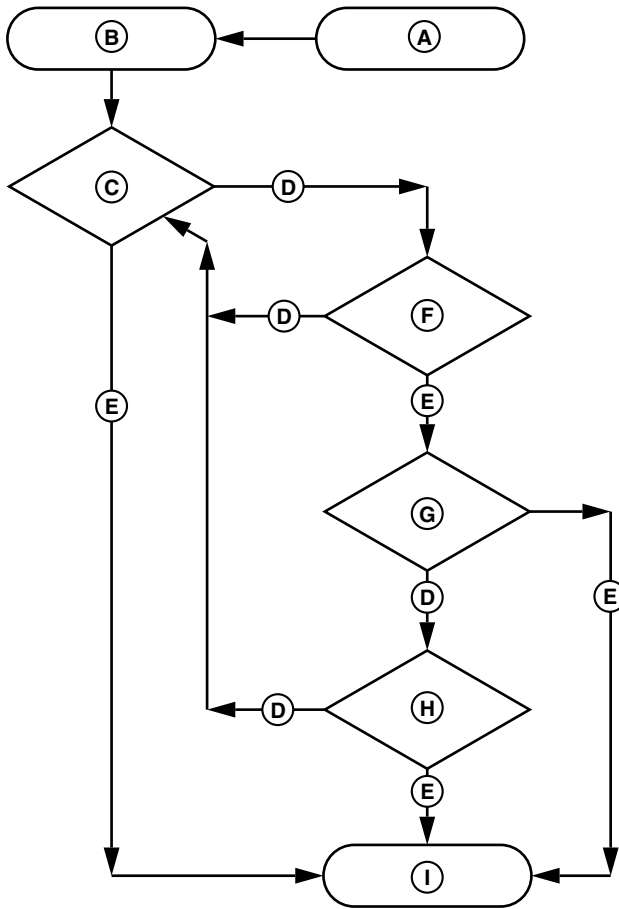
Engine on, Operator ON Seat Logic

The seat switch is the main and most direct circuit to provide input to the A1 display panel that will provide an output to the K1 fuel relay coil.

This on seat logic circuit provides voltage to the fuel relay for normal operator on seat use of the machine.

Power is provided through the key switch, 072 Red wires, F7 fuse, 562 Red wires, S8 seat switch (operator on seat), and 539 Wht wires to the A1 display panel (X7 connector, terminal L).

The display panel will then provide an output on the 304 Yel wire to energize the K1 fuel relay and close its contacts. This in turn will provide voltage to the Y2 fuel shutoff solenoid pull-in coil.



Fuel Supply/Engine Shutoff Circuit Operation Flow Chart

- A—Fuel Solenoid Off
 B—Place Key Switch in run Position.
 C—Operator On Seat?
 D—No
 E—Yes
 F—Transmission in Neutral?
 G—PTOs Off?
 H—Off Seat PTO Logic On?
 I—Fuel Solenoid On

After a short delay, the display panel will provide an output on the 302 Red wire to the Y2 fuel shutoff solenoid hold-in coil. At the same time, the display panel will remove the output to the K1 fuel relay over the 304 Yel wire.

Engine On, Operator OFF Seat Logic

The S4 rear PTO switch in combination with the S11 transmission neutral switch (PRT), or W4 jumper (eHydro™), is a second path to provide power to the K1 fuel relay coil.

The rear PTO switch, in combination with the transmission neutral switch (PRT), or W4 jumper (eHydro™), provides power to the fuel circuit. Power is provided from the key switch to the 072 Red wires, F7 fuse, and 562 Red wires.

A 562 Red wire provides power to the S4 rear PTO switch (PTO off), 573 Org wire, and A1 display panel (X7 connector, terminal K).

A 562 Red wire provides power to the S21 front PTO switch (PTO off), 733 Org wire, and A1 display panel (X11 connector, terminal A).

At the same time a 562 Red wire provides power to the S11 transmission neutral switch (PRT) or W4 jumper (eHydro™), 519 Wht wire, and A1 display panel (X10 connector, terminal B).

The display panel will then provide an output on the 304 Yel wire to the K1 fuel relay to energize the relay and close its contacts, if the PTO is off and the transmission is in neutral, without the operator on the seat. This in turn will provide voltage to the Y2 fuel shutoff solenoid pull-in coil.

After a short delay, the display panel will provide an output on the 302 Red wire to the Y2 fuel shutoff solenoid hold-in coil. At the same time, the display panel will remove the output to the K1 fuel relay over the 304 Yel wire, de-energizing the fuel shutoff solenoid pull-in coil.

Engine On, Operator OFF Seat, Front or Rear PTO Engaged Logic (Off Seat PTO Logic)

To operate a machine with the rear PTO engaged and allow the operator to leave the seat requires that the Off seat PTO logic be activated. The off seat PTO logic is activated and deactivated automatically as the operator uses different functions of the machine.

To activate the off seat PTO logic the A1 display panel requires proper input signals from the following circuits during the following conditions:

Input Circuit	Operating Condition
Seat switch	Operator on seat
Rear PTO switch	Off position
Front PTO switch	Off position
Park brake switch	Park brake locked
Transmission neutral switch (PRT), or W4 jumper (eHydro™)	Transmission in neutral
W3 Mid PTO jumper, or optional S9 Mid PTO switch	S9 Mid PTO switch off (if equipped)
Optional S21 front PTO switch	S21 optional front PTO switch off
Alternator	Engine running

Once the off seat PTO logic has been activated, the operator may leave the seat and then engage the front or rear PTO. With the mid PTO engaged, the operator must remain on the seat in order for the engine to remain running.

Except for the seat switch, if any of the other inputs change once the operator has left the seat and engages the front or rear PTO, the engine will shutoff.

If the operator returns to the seat, the engine will continue to run with the front or rear PTO engaged, however the off seat PTO logic will be deactivated and the engine will shutoff if the operator leaves the seat, unless the off seat PTO logic is activated again.

The A1 display panel requires four constant and two changing inputs to operate the rear PTO with operator off the seat. Five inputs supply battery voltage and one input supplies a frequency signal to the display panel to activate the off seat PTO logic. The changing inputs are from the seat switch indicating that the operator has left the seat, and the front or rear PTO switch indicating that the operator has engaged the front or rear PTO.

The switched power circuit provides power to the display panel through the following circuits:

- A 562 Red wire provides power to the S11 transmission neutral switch (PRT), or W4 jumper (eHydro™), 519 Wht wire, and A1 display panel (X10 connector, terminal B).
- A 562 Red wire provides power to the S12 park brake switch (park brake locked), 586 Blu wire, and A1 display panel (X10 connector, terminal K).
- A 562 Red wire provides power to the X8 connector, (S9 Mid PTO switch, if equipped), 594 Yel wire, and A1 display panel (X11 connector, terminal D).
- The 562E Red wire provides power to the S8 seat switch (operator on seat), 539C and 539A Wht wires, and A1 display panel (X7 connector, terminal L).

- A 562 Red wire provides power to the S4 rear PTO switch (PTO off), 573 Org wire, and A1 display panel (X7 connector, terminal K).
- A 562 Red wire provides power to the S21 front PTO switch (PTO off), 733 Org wire, and A1 display panel (X11 connector, terminal A).

Once the inputs have been established, the operator may leave the seat, removing power from X7 connector, terminal L and engage the front or rear PTO removing power from X7 connector, terminal K (rear) or X11 connector, terminal A (front).

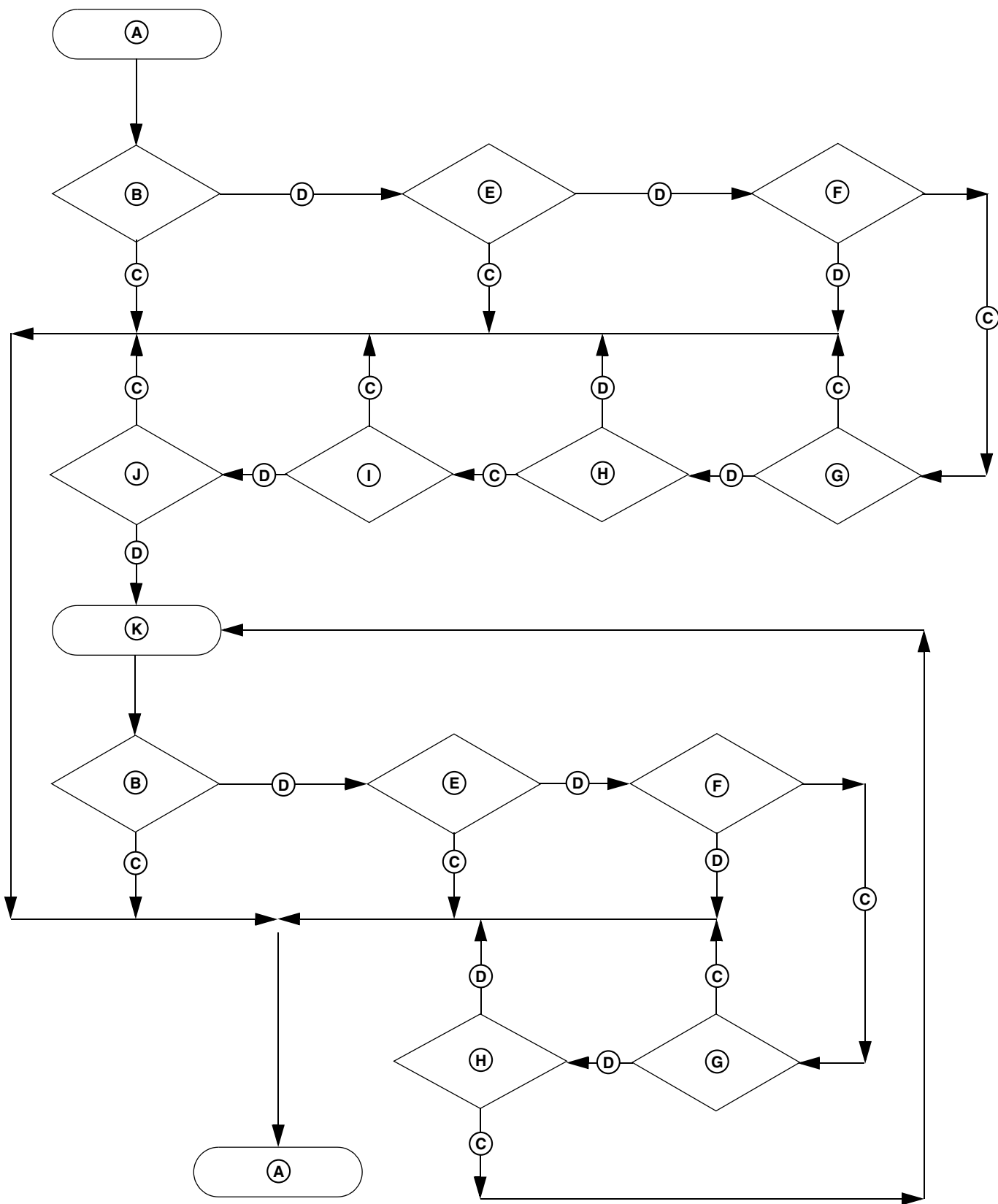
The front or rear PTO will remain engaged until the operator disengages the rear PTO, or unlocks the park brake, or engages the mid PTO, or places the transmission in gear (PRT), or places the key switch in either the OFF or the start position.

If the operator returns to the seat, the front or rear PTO will remain engaged, however, the off seat PTO logic will be deactivated.

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AK82585,271AFF7 -19-11JAN13-3/5



LVAL17480 —UN—29APR11

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AK82585,271AFF7 -19-11JAN13-4/5

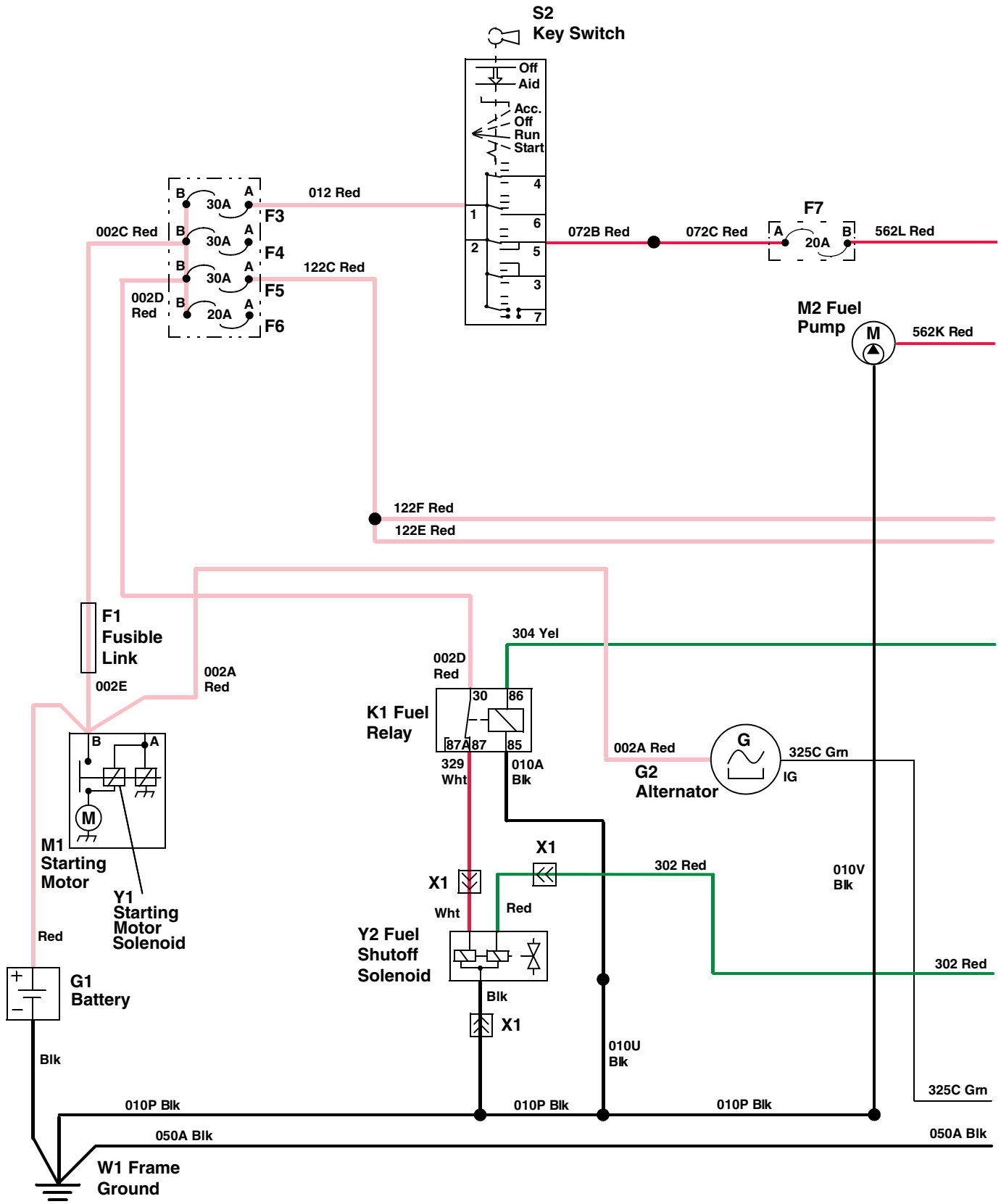
A—Off Seat PTO Logic Off
B—Mid PTO Off?
C—No
D—Yes
E—Park Brake Locked?

F—Operator On Seat?
G—Transmission in Neutral?
H—Engine Crank Signal On?

I— Front/Rear PTOs Off?
J— Engine Cranked at Least
Once?
K—Off Seat PTO Logic On

AK82585,271AFF7 -19-11JAN13-5/5

Fuel Supply/Engine Shutoff Circuit Electrical Schematic—Pre MY08



LVAL11981—UN—12NOV10

Continued on next page

KN52281,1004387 -19-01NOV12-1/4

F1— Fusible Link
F3— Fuse 30A
F4— Fuse 30A
F5— Fuse 30A
F6— Fuse 20A
F7— Fuse 20A

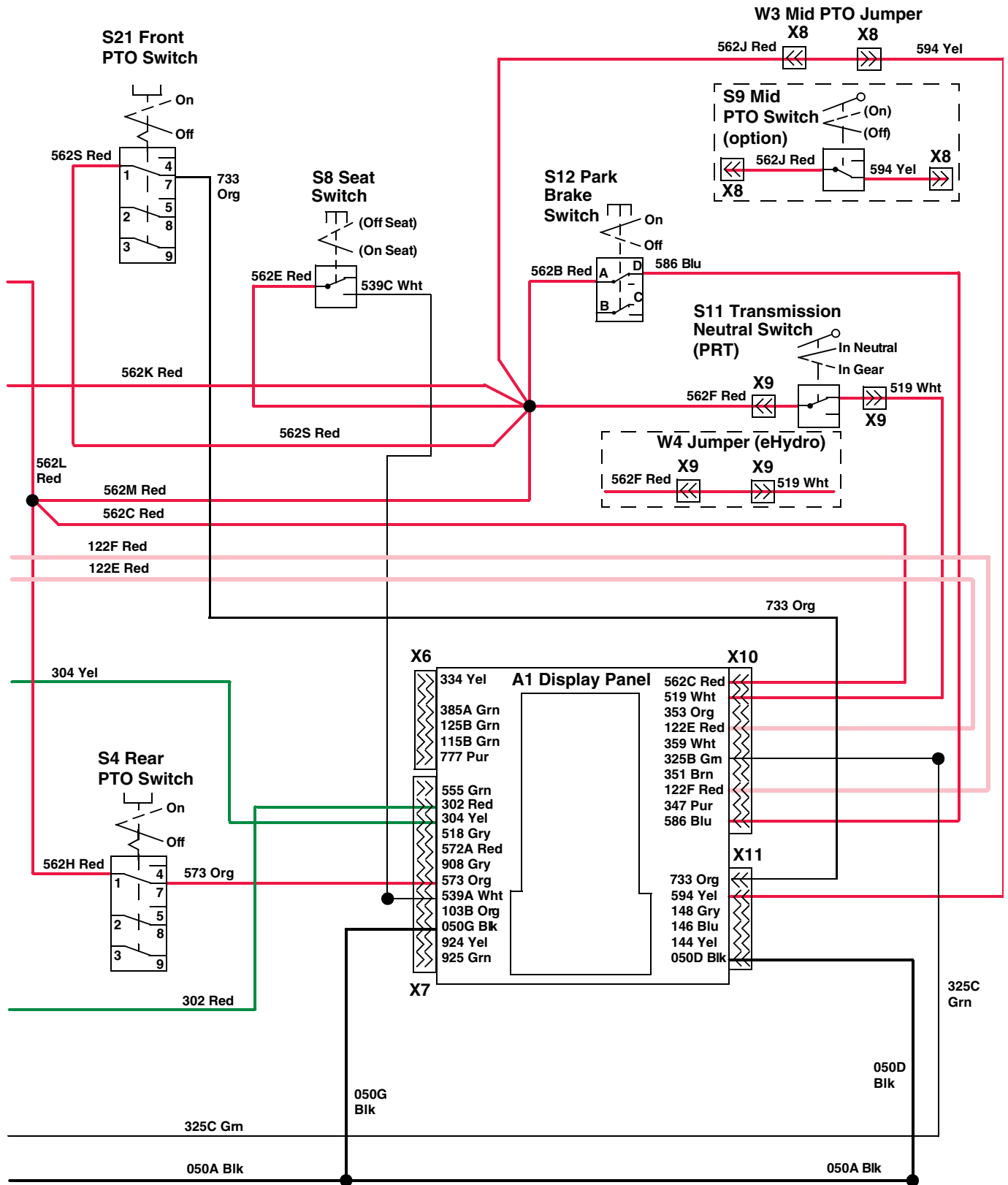
G1—Battery
G2—Alternator
K1—Fuel Relay
M1—Starting Motor
M2—Fuel Pump
S2— Key Switch

W1—Battery/Frame Ground
X1— W1 Main Wiring Harness to
Y2 Fuel Shutoff Solenoid

Y1— Starting Motor Solenoid
Y2— Fuel Shutoff Solenoid

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KN52281,1004387 -19-01NOV12-2/4



LVAL11982—UN—12NOV10

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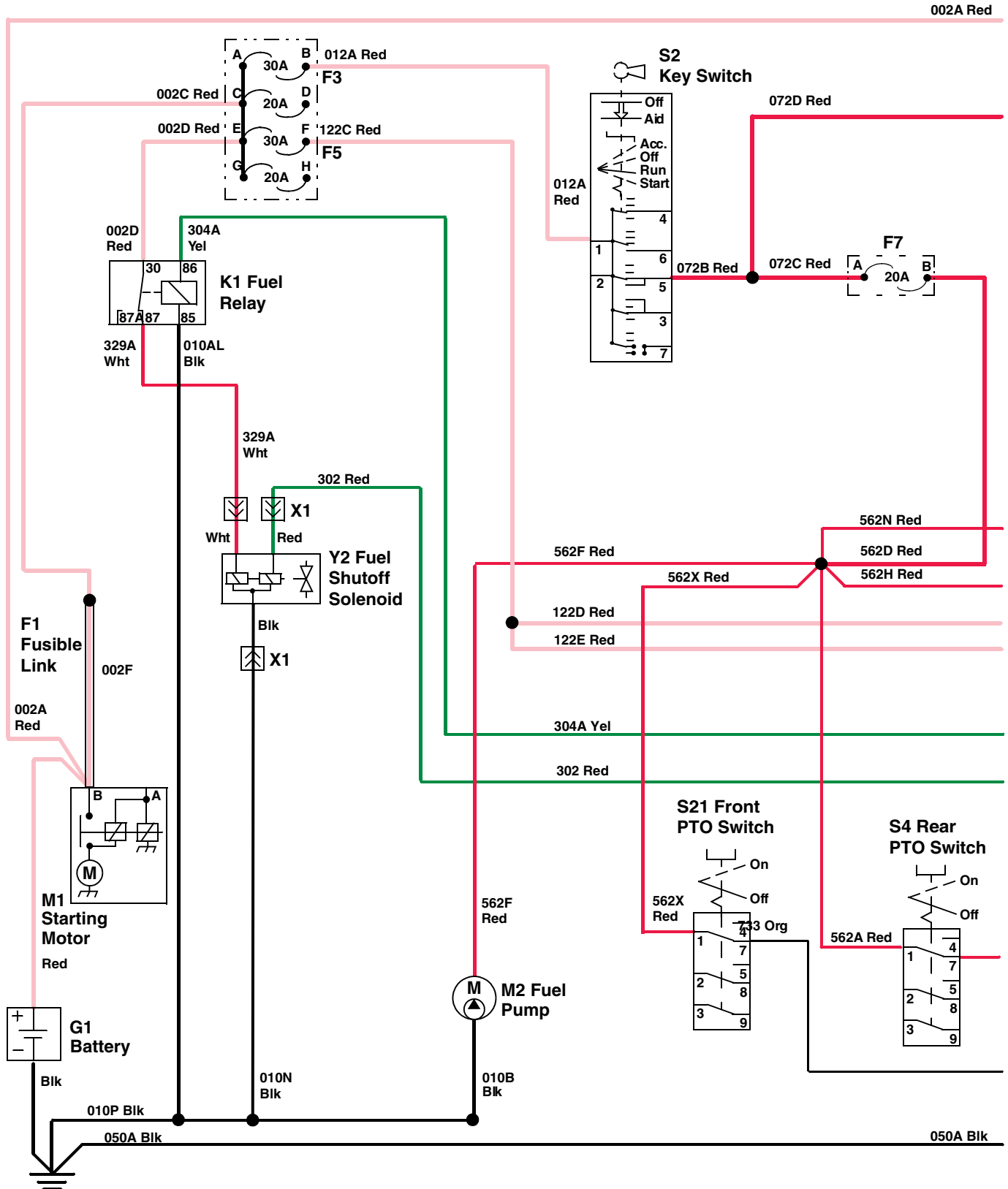
KN52281,1004387 -19-01NOV12-3/4

A1—Display Panel	W3—Jumper Plug	X9—W1 Main Wiring Harness to	X11— W1 Main Wiring Harness
S4—Rear PTO Switch	W4—Jumper Plug	S11 Transmission Neutral	to A1 Display Panel
S8—Seat Switch	X6—W1 Main Wiring Harness to	Switch (PRT), W4 Jumper	
S9—Mid PTO Switch (optional)	A1 Display Panel	Plug (eHydro™)	
S11— Transmission Neutral	X7—W1 Main Wiring Harness to	X10— W1 Main Wiring Harness	
Switch (PRT)	A1 Display Panel	to A1 Display Panel	
S12— Park Brake Switch	X8—W1 Main Wiring Harness to		
S21— Front PTO Switch	W3 Jumper Plug (standard),		
	S9 Mid PTO Switch (optional)		

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KN52281,1004387 -19-01NOV12-4/4

Fuel Supply/Engine Shutoff Circuit Electrical Schematic—MY08



LVAL11983 —UN—12NOV10

Continued on next page

KN52281,1004388 -19-23OCT12-1/4

F1— Fusible Link
F3— Fuse 30A
F5— Fuse 30A
F7— Fuse 20A
G1—Battery

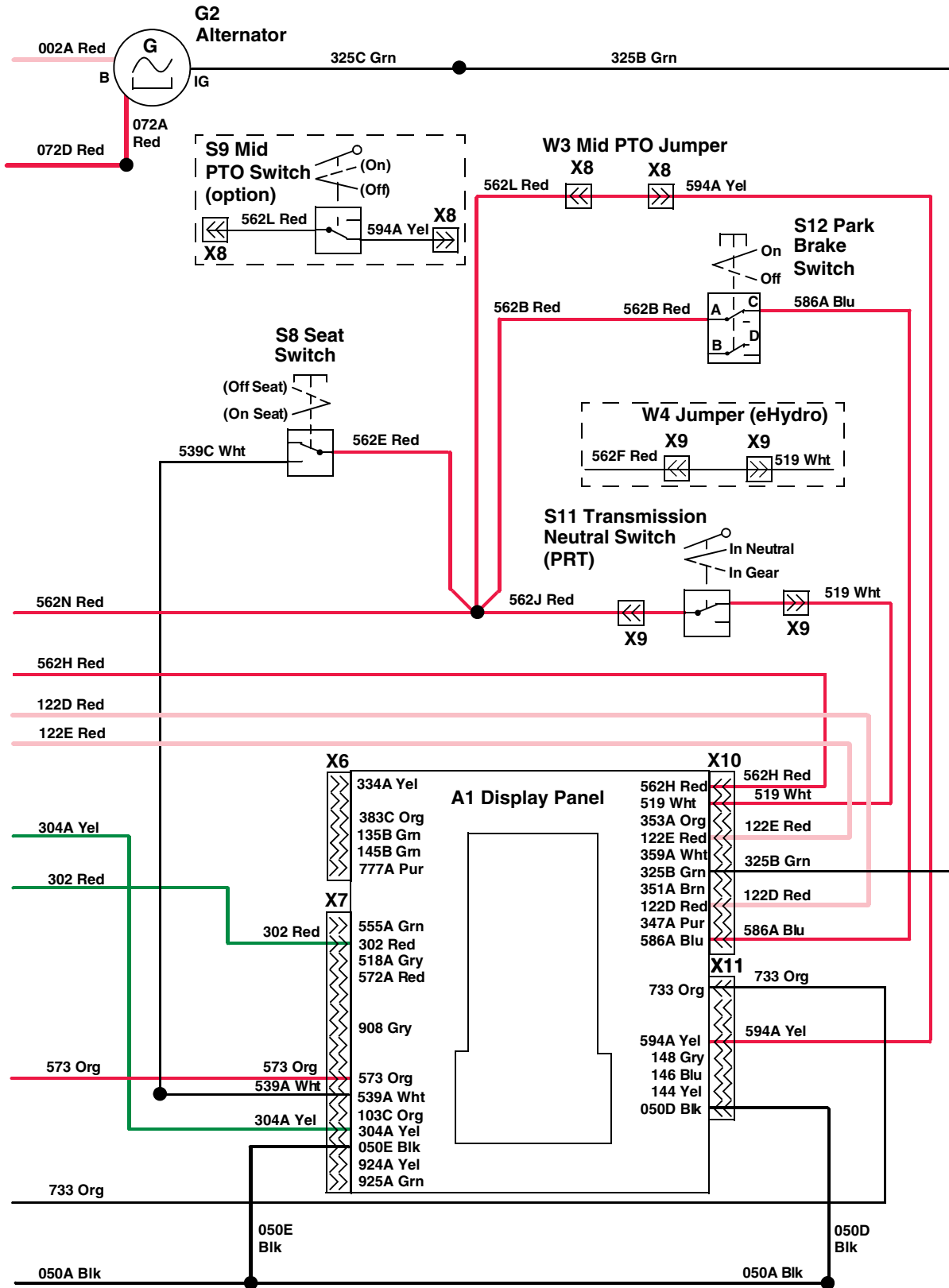
K1—Fuel Relay
M1—Starting Motor
M2—Fuel Pump
S2— Key Switch

S4—Rear PTO Switch
S21— Front PTO Switch
X1— W1 Main Wiring Harness to
Y2 Fuel Shutoff Solenoid

Y2— Fuel Shutoff Solenoid

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KN52281,1004388 -19-23OCT12-2/4



LVAL11984—UN—12NOV10

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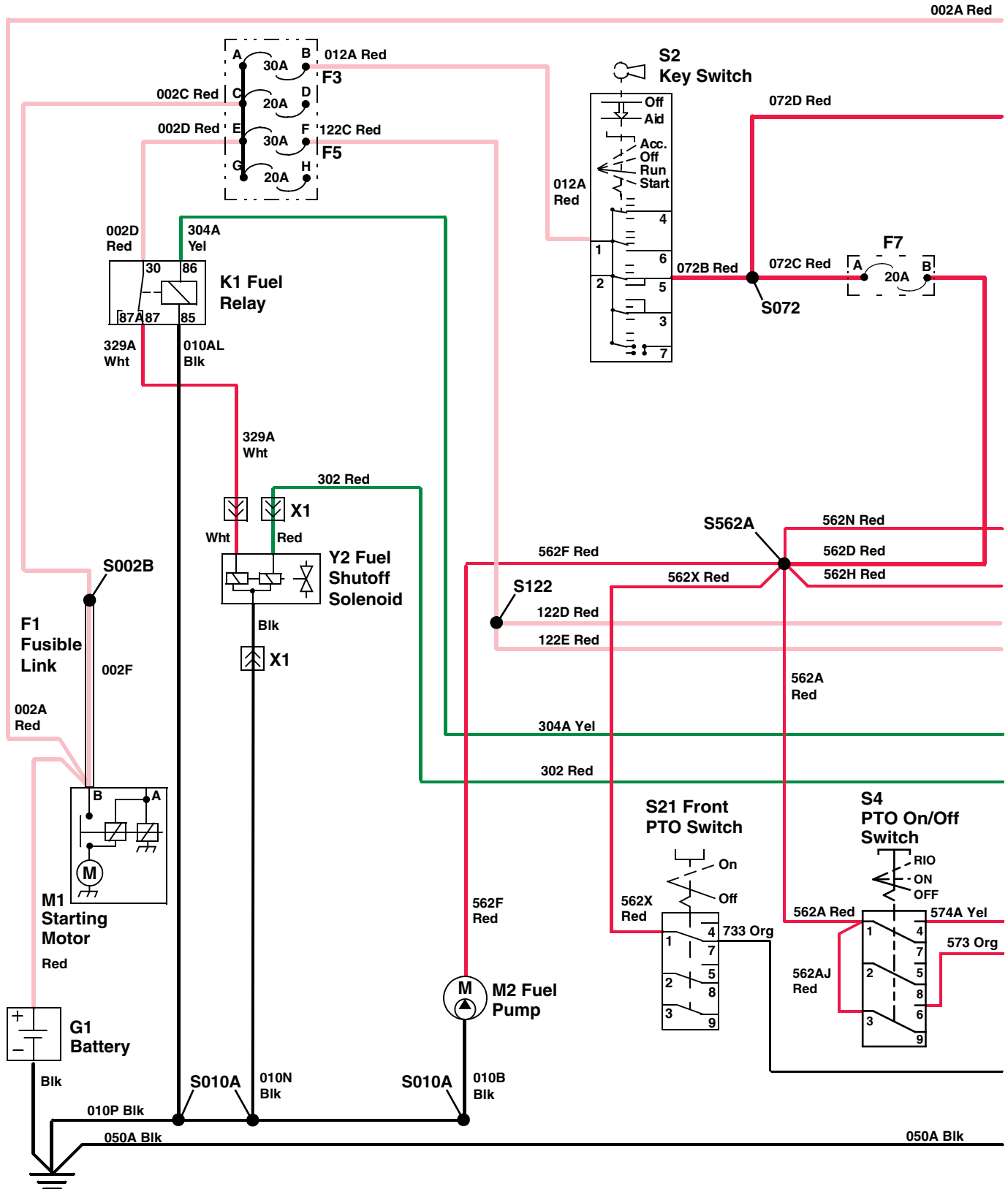
KN52281,1004388 -19-23OCT12-3/4

A1—Display Panel	W3—Jumper Plug	X9—W1 Main Wiring Harness to	X11— W1 Main Wiring Harness
G2—Alternator	W4—Jumper Plug	S11 Transmission Neutral	to A1 Display Panel
S8—Seat Switch	X6—W1 Main Wiring Harness to	Switch (PRT), W4 Jumper	
S9—Mid PTO Switch (optional)	A1 Display Panel	Plug (eHydro™)	
S11— Transmission Neutral	X7—W1 Main Wiring Harness to	X10— W1 Main Wiring Harness	
Switch (PRT)	A1 Display Panel	to A1 Display Panel	
S12— Park Brake Switch	X8—W1 Main Wiring Harness to		
S21— Front PTO Switch	W3 Jumper Plug (standard),		
	S9 Mid PTO Switch (optional)		

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KN52281,1004388 -19-23OCT12-4/4

Fuel Supply/Engine Shutoff Circuit Electrical Schematic—MY13



Continued on next page

KN52281,10043CB -19-09JAN13-1/4

F1— Fusible Link
F3— Fuse 30A
F5— Fuse 30A
F7— Fuse 20A
G1—Battery

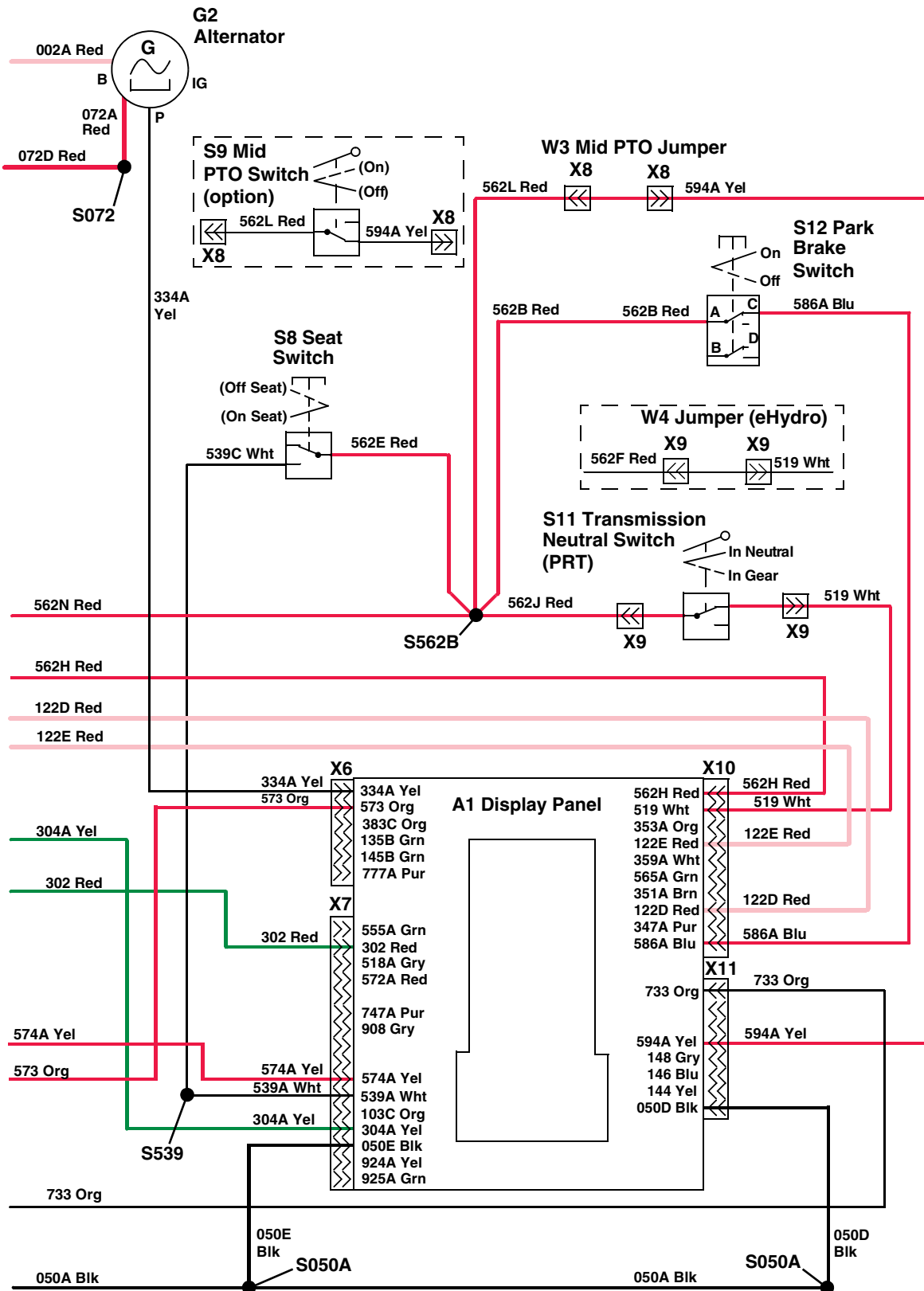
K1—Fuel Relay
M1—Starting Motor
M2—Fuel Pump
S2— Key Switch

S4—Rear PTO Switch
S21— Front PTO Switch
X1— W1 Main Wiring Harness to
Y2 Fuel Shutoff Solenoid

Y2— Fuel Shutoff Solenoid

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KN52281,10043CB -19-09JAN13-2/4



LVAL38887—UN—26NOV12

Continued on next page

KN52281,10043CB -19-09JAN13-3/4

A1—Display Panel	W4—Jumper Plug	X9—W1 Main Wiring Harness to S11 Transmission Neutral Switch (PRT), W4 Jumper Plug (eHydro™)	X11— W1 Main Wiring Harness to A1 Display Panel
G2—Alternator	X6— W1 Main Wiring Harness to A1 Display Panel	X10— W1 Main Wiring Harness to A1 Display Panel	
S8—Seat Switch	X7— W1 Main Wiring Harness to A1 Display Panel		
S9—Mid PTO Switch (optional)	X8— W1 Main Wiring Harness to W3 Jumper Plug (standard), S9 Mid PTO Switch (optional)		
S11— Transmission Neutral Switch (PRT)			
S12— Park Brake Switch			
W3—Jumper Plug			

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KN52281,10043CB -19-09JAN13-4/4

Fuel Supply/Engine Shutoff Circuit Diagnosis

Test Procedure A

Fault codes Err68 and Err69 indicate a problem with the output signal on the 302 Red wire, 304 Yel wire or the K1 fuel relay.

- Park brake locked
- Transmission in neutral
- PTO(s) OFF
- Operator on seat
- Key switch in run position

Test Conditions:

KN52281,1004389 -19-07DEC12-1/22

Fuel Relay Circuit (Pull-in Coil)—Display Output

KN52281,1004389 -19-07DEC12-2/22

Step 1

Is either fault code Err68 or Err69 showing on the display panel?

YES: Fault code Err68—Check 302 Red wire for short to ground. Test K1 fuel relay. (See [Relay Test](#) in Section 40, Group 40.)

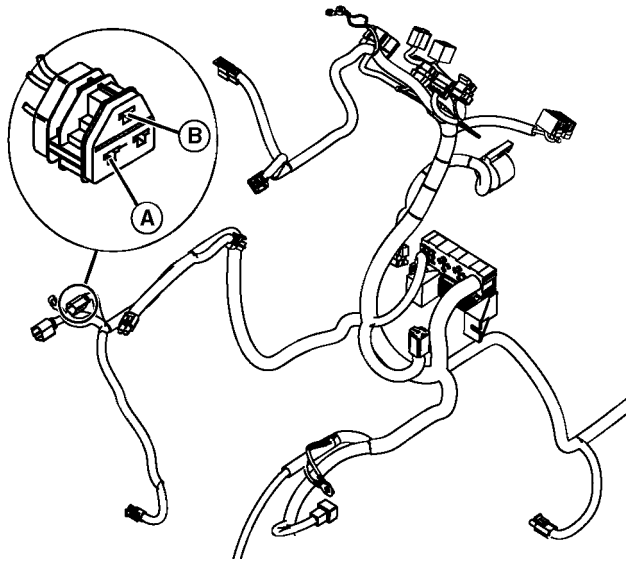
YES: Fault code Err69—Check 302 Red wire for short to battery voltage or open circuit. Test K1 fuel relay.

NO: Go to next step.

Continued on next page

KN52281,1004389 -19-07DEC12-3/22

Step 2



LVAL11985 —UN—12NOV10

A—X1 Connector Terminal B, 302 Red Wire
B—X1 Connector Terminal A, 010 Blk Wire

Disconnect fuel shutoff solenoid, X1 connector. Is a momentary battery voltage present at terminal B, 302 Red wire (A) when the key switch is put in the Run position?

YES: Go to next step.

NO: Check continuity on 329 Wht wire from relay terminal 87.

KN52281,1004389 -19-07DEC12-4/22

Step 3

Is continuity to ground present at terminal A, 010 Blk wire (B)?

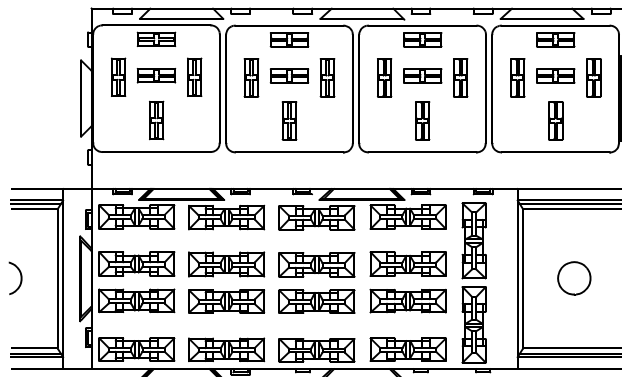
YES: Replace fuel shutoff solenoid.

NO: Connect fuel shutoff solenoid connector. Check 010N and 010P Blk wires and connections.

KN52281,1004389 -19-07DEC12-5/22

Step 4

NOTE: Relay positions are different between old and new machines. Check machine specific load center arrangements. (See Load Center—Pre MY08 in Section 50, Group 15.) and (see Load Center—MY08 in Section 50, Group 20.)



LVAL11986 —UN—12NOV10

Remove K1 fuel relay. Is battery voltage present at K1 fuel relay terminal 30, 002D Red wire?

YES: Go to next step.

NO: Check F1 fusible link, 002C and 002D Red wires and connections.

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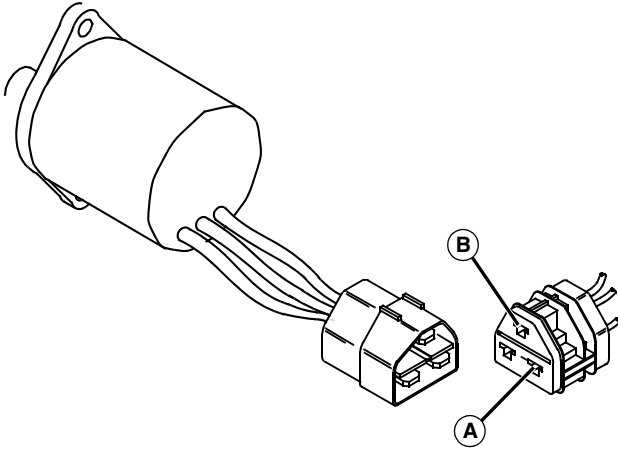
KN52281,1004389 -19-07DEC12-6/22

Step 5	Is a momentary battery voltage present at K1 fuel relay terminal 86, 304 Yel wire?	<p>YES: Go to next step.</p> <p>NO: Check that test conditions are met. Check 304 Yel wire and connections.</p> <p>KN52281,1004389 -19-07DEC12-7/22</p>
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Step 6	Is continuity to ground present at K1 fuel relay terminal 85, 010 Blk wire (E)?	<p>YES: Replace fuel relay.</p> <p>NO: Install fuel relay. Check 010 Blk wires and connections. If ok, go to next step.</p> <p>KN52281,1004389 -19-07DEC12-8/22</p>
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<p>Test Procedure B</p> <p>Test Conditions:</p> <ul style="list-style-type: none"> • Park brake locked. • Transmission in neutral. 	<ul style="list-style-type: none"> • PTO(s) off. • Operator on seat. • Key switch in run position. • Y2 fuel shutoff solenoid disconnected. <p>KN52281,1004389 -19-07DEC12-9/22</p>
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<p>Fuel Shutoff Circuit (Hold-in Coil)—Display Output</p> <p>KN52281,1004389 -19-07DEC12-10/22</p>

Step 1	 <p>LVAL11987 —UN—12NOV10</p> <p>A—Y2 Fuel Shutoff Solenoid, 302 Red Wire B—Y2 Fuel Shutoff Solenoid, 010 Blk Wire</p> <p>Is battery voltage present at 302 Red wire (A) of Y2 fuel shutoff solenoid?</p>	<p>YES: Go to next step.</p> <p>NO: Check 302 Red wire and connections.</p> <p>KN52281,1004389 -19-07DEC12-11/22</p>
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Step 2	Is continuity to ground present at 010 Blk wire (B) of Y2 fuel shutoff solenoid?	<p>YES: Replace Y2 fuel shutoff solenoid.</p> <p>NO: Check 010 Blk wires and connections. Connect fuel shutoff solenoid connector.</p> <p>Continued on next page</p> <p>KN52281,1004389 -19-07DEC12-12/22</p>
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Test Procedure C

Test Conditions:

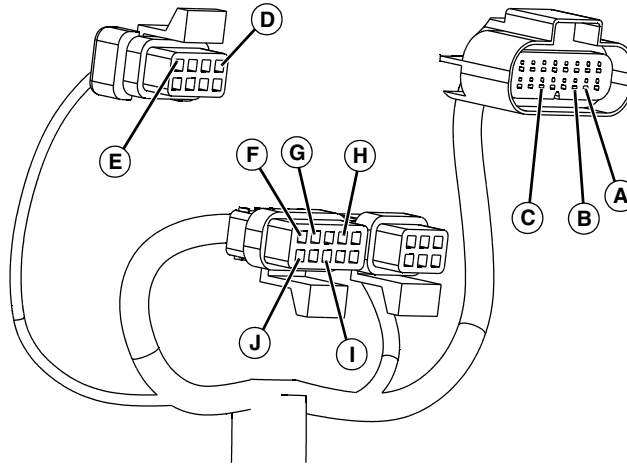
- Park brake locked.
- Transmission in neutral.
- PTO(s) off.
- Operator on seat.
- Key switch in run position.

KN52281,1004389 -19-07DEC12-13/22

Fuel Relay Circuit—Display Input

KN52281,1004389 -19-07DEC12-14/22

Step 1



LVAL11988 —UN—12NOV10

- A—X7 Connector Terminal K, 573 Org Wire
- B—X7 Connector Terminal L, 539A Wht Wire
- C—X7 Connector Terminal P, 050 Blk Wire
- D—X11 Connector Terminal H, 050D Blk Wire
- E—X11 Connector Terminal A, 733 Org Wire
- F—X10 Connector Terminal A, 562 Red Wire
- G—X10 Connector Terminal B, 519 Wht Wire
- H—X10 Connector Terminal D, 122E Red Wire
- I—X10 Connector Terminal H, 122 Red Wire
- J—X10 Connector Terminal K, 586 Blu Wire

Disconnect X7 connector to the display panel. Is battery voltage present at terminal K, 573 Org (A), and terminal L, 539A Wht (B) wires?

YES: Go to next step.

NO: No voltage present at 573 Org wire. Test rear PTO switch. Check 573 Org wire and connections. Test power circuit. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

NO: No voltage present at 539A Wht wire with seat switch closed. Test seat switch. Check 539A and 539B Wht wires and connections. Test power circuit.

KN52281,1004389 -19-07DEC12-15/22

Step 2

Is continuity to ground present at X7 connector terminal P, 050 Blk wire (C)?

YES: Go to next step.

NO: Check 050 Blk wires and connections.

KN52281,1004389 -19-07DEC12-16/22

Step 3

Disconnect X11 connector to the display panel. Is continuity to ground present at terminal H, 050D Blk wire (D)?

YES: Connect X11 connector. Go to next step.

NO: Check 050 Blk wires and connections.

Continued on next page

KN52281,1004389 -19-07DEC12-17/22

Step 4

Is battery voltage present at X11 connector terminal A, 733 Org wire (E)?

YES: Connect X11 connector. Go to next step.
NO: Check 733 Org wire and connections. Test front PTO switch. Test power circuit.

KN52281,1004389 -19-07DEC12-18/22

Step 5

Disconnect X10 connector to the display panel. Is battery voltage present at terminal A, 562 Red (F), terminal B, 519 Wht (G), terminal D, 122E Red (H), terminal H, 122 Red (I), and terminal K, 586 Blu (J) wires?

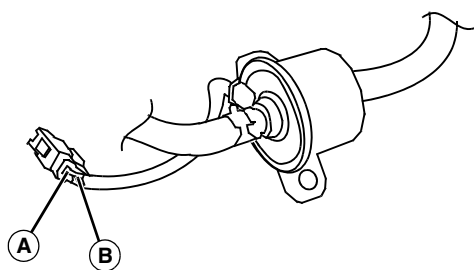
YES: Connect X10 connector. With no output on 302 Red wire at X7 connector terminal B (K), replace the display panel.
NO: No voltage present at 562 Red wire. Test switched power circuit.
NO: No voltage present at 519 Wht wire. Test transmission neutral switch (PRT) or that jumper plug is installed in X9 connector. Check 519 Wht wire and connections. Test power circuit.
NO: No voltage present at 122 Red wires. Test unswitched power circuit.
NO: No voltage present at 586 Blu wire. Test park brake switch. Check 586 Blu wire and connections. Test power circuit.

KN52281,1004389 -19-07DEC12-19/22

Fuel Pump Circuit

KN52281,1004389 -19-07DEC12-20/22

Step 1



LVAL11989 —UN—12NOV10

A—M2 Fuel Pump, 562 Red Wire
B—M2 Fuel Pump, 010 Blk Wire

Is battery voltage present at 562 Red wire (A) of M2 fuel pump?

YES: Go to next step.

NO: Check 562 Red wires and connections. If OK, test fuel pump.
NO: Check power circuit. (See [Power Circuit Operation](#) in Section 50, Group 35.)

Continued on next page

KN52281,1004389 -19-07DEC12-21/22

Step 2

Is there continuity between 010 Blk wire (B) of M2 fuel pump and ground?

YES: Replace fuel pump.
NO: Check 010 Blk wires and connections.

KN52281,1004389 -19-07DEC12-22/22

Fuel Supply/Engine Shutoff Circuit Diagnosis—MY13

Test Procedure A

Fault codes Err68 and Err69 indicate a problem with the output signal on the 302 Red wire, 304 Yel wire or the K1 fuel relay.

Test Conditions

- Park brake locked.
- Transmission in neutral.
- PTO(s) off.
- Operator on seat.
- Key switch in run position.

AK82585,271AF27 -19-21JAN13-1/22

Fuel Relay Circuit (Pull-in Coil)—Display Output

AK82585,271AF27 -19-21JAN13-2/22

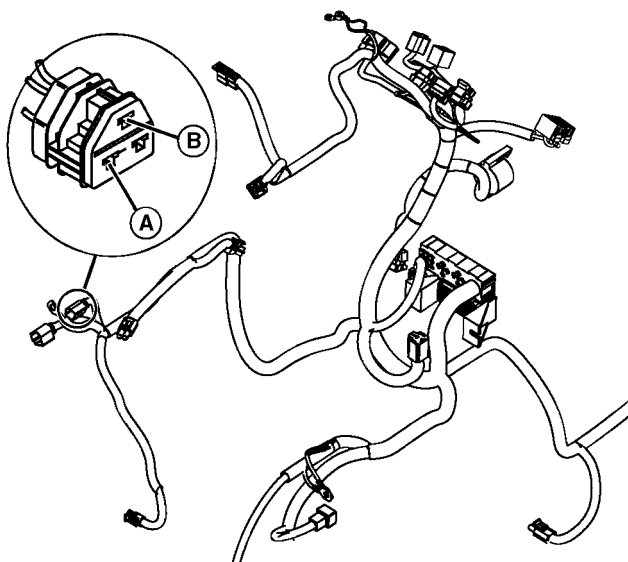
Step 1

Is either fault code Err68 or Err69 showing on the display panel?

YES: Fault code Err68—Check 302 Red wire for short to ground. Test K1 fuel relay. (See [Relay Test.](#))
YES: Fault code Err69—Check 302 Red wire for short to battery voltage or open circuit. Test K1 fuel relay.
NO: Go to next step.

AK82585,271AF27 -19-21JAN13-3/22

Step 2



LVAL11985 —UN—12NOV10

A—X1 Connector Terminal B, 329A Wht Wire
B—X1 Connector Terminal C, 010N Blk Wire

Disconnect fuel shutoff solenoid, X1 connector. Is a momentary battery voltage present at terminal B, 329A Wht wire (A) when the key switch is put in the run position?

YES: Go to next step.

NO: Check continuity on 329A Wht wire from relay terminal 87.

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AK82585,271AF27 -19-21JAN13-4/22

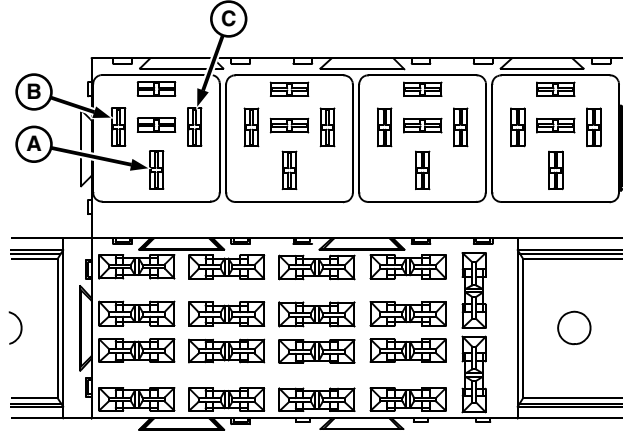
Step 3

Is continuity to ground present at terminal C, 010N Blk wire (B)?

YES: Replace fuel shutoff solenoid.
NO: Connect fuel shutoff solenoid connector. Check 010N and 010P Blk wires and connections.

AK82585,271AF27 -19-21JAN13-5/22

Step 4



LVAL41031 —UN—09JAN13

Remove K1 fuel relay. Is battery voltage present at K1 fuel relay terminal 30, 002D Red wire (A)?

YES: Go to next step.

NO: Check F1 fusible link, 002C and 002D Red wires and connections.

AK82585,271AF27 -19-21JAN13-6/22

Step 5

Is a momentary battery voltage present at K1 fuel relay terminal 86, 304A Yel wire (C)?

YES: Go to next step.
NO: Check that test conditions are met. Check 304A Yel wire and connections.

AK82585,271AF27 -19-21JAN13-7/22

Step 6

Is continuity to ground present at K1 fuel relay terminal 85, 010E Blk wire (B)?

YES: Replace fuel relay.
NO: Install fuel relay. Check 010 Blk wires and connections. If ok, go to next step.

AK82585,271AF27 -19-21JAN13-8/22

Test Procedure B

Test Conditions

- Park brake locked.
- Transmission in neutral.

- PTO(s) off.
- Operator on seat.
- Key switch in run position.
- Y2 fuel shutoff solenoid disconnected.

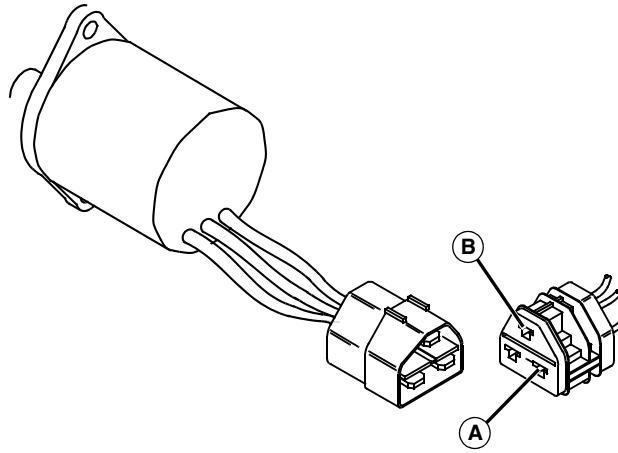
AK82585,271AF27 -19-21JAN13-9/22

Fuel Shutoff Circuit (Hold-in Coil)—Display Output

Continued on next page

AK82585,271AF27 -19-21JAN13-10/22

Step 1



LVAL11987 —UN—12NOV10

A—Y2 Fuel Shutoff Solenoid, 302 Red Wire
B—Y2 Fuel Shutoff Solenoid, 010N Blk Wire

Is battery voltage present at 302 Red wire (A) of Y2 fuel shutoff solenoid?

YES: Go to next step.

NO: Check 302 Red wire and connections.

AK82585,271AF27 -19-21JAN13-11/22

Step 2

Is continuity to ground present at 010N Blk wire (B) of Y2 fuel shutoff solenoid?

YES: Replace Y2 fuel shutoff solenoid.

NO: Check 010N Blk wires and connections. Connect fuel shutoff solenoid connector.

AK82585,271AF27 -19-21JAN13-12/22

Test Procedure C

Test Conditions

- Park brake locked.

- Transmission in neutral.
- PTO(s) off.
- Operator on seat.
- Key switch in run position.

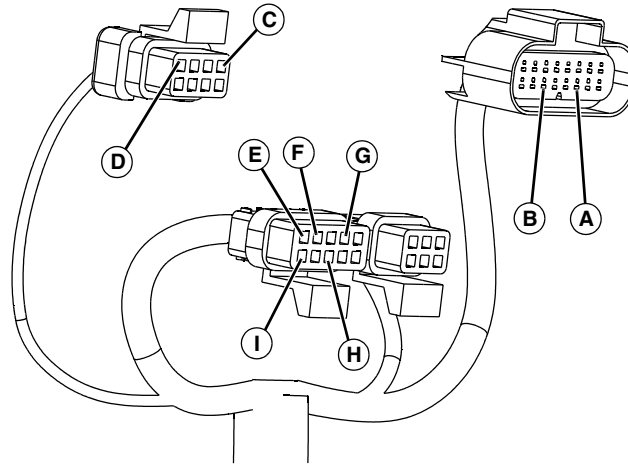
AK82585,271AF27 -19-21JAN13-13/22

Fuel Relay Circuit—Display Input

Continued on next page

AK82585,271AF27 -19-21JAN13-14/22

Step 1



LVAL38967 —UN—03DEC12

A—X7 Connector Terminal L, 539A Wht Wire
B—X7 Connector Terminal P, 050E Blk Wire
C—X11 Connector Terminal H, 050D Blk Wire
D—X11 Connector Terminal A, 733 Org Wire
E—X10 Connector Terminal A, 562H Red Wire
F—X10 Connector Terminal B, 519 Wht Wire
G—X10 Connector Terminal D, 122E Red Wire
H—X10 Connector Terminal H, 122D Red Wire
I—X10 Connector Terminal K, 586A Blu Wire

Disconnect X7 connector to the display panel. Is battery voltage present at terminal L, 539A Wht (A) wires?

YES: Go to next step.

NO: No voltage present at 539A Wht wire with seat switch closed. Test seat switch. Check 539A and 539B Wht wires and connections. Test power circuit.

AK82585,271AF27 -19-21JAN13-15/22

Step 2

Is continuity to ground present at X7 connector terminal P, 050E Blk wire (B)?

YES: Go to next step.

NO: Check 050 Blk wires and connections.

AK82585,271AF27 -19-21JAN13-16/22

Step 3

Disconnect X11 connector to the display panel. Is continuity to ground present at terminal H, 050D Blk wire (C)?

YES: Connect X11 connector. Go to next step.

NO: Check 050 Blk wires and connections.

AK82585,271AF27 -19-21JAN13-17/22

Step 4

Is battery voltage present at X11 connector terminal A, 733 Org wire (D)?

YES: Connect X11 connector. Go to next step.

NO: Check 733 Org wire and connections. Test front PTO switch. Test power circuit.

Continued on next page

AK82585,271AF27 -19-21JAN13-18/22

Step 5

Disconnect X10 connector to the display panel. Is battery voltage present at terminal A, 562H Red (E), terminal B, 519 Wht (F), terminal D, 122E Red (G), terminal H, 122D Red (H), and terminal K, 586A Blu (I) wires?

YES: Connect X10 connector. With no output on 302 Red wire at X7 connector terminal B (K), replace the display panel.

NO: No voltage present at 562H Red wire. Test switched power circuit.

NO: No voltage present at 519 Wht wire. Test transmission neutral switch (PRT) or that jumper plug is installed in X9 connector. Check 519 Wht wire and connections. Test power circuit.

NO: No voltage present at 122 Red wires. Test unswitched power circuit.

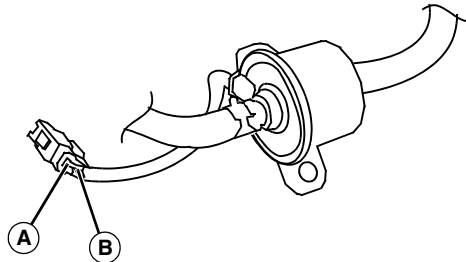
NO: No voltage present at 586A Blu wire. Test park brake switch. Check 586A Blu wire and connections. Test power circuit.

AK82585,271AF27 -19-21JAN13-19/22

Fuel Pump Circuit

AK82585,271AF27 -19-21JAN13-20/22

Step 1



LVAL11989 —UN—12NOV10

A—M2 Fuel Pump, 562F Red Wire
B—M2 Fuel Pump, 010B Blk Wire

Is battery voltage present at 562F Red wire (A) of M2 fuel pump?

YES: Go to next step.

NO: Check 562 Red wires and connections. If OK, test fuel pump.

NO: Check power circuit. (See [Power Circuit Operation](#).)

AK82585,271AF27 -19-21JAN13-21/22

Step 2

Is there continuity between 010B Blk wire (B) of M2 fuel pump and ground?

YES: Replace fuel pump.

NO: Check 010 Blk wires and connections.

AK82585,271AF27 -19-21JAN13-22/22

Charging Circuit Operation

Function

To maintain battery voltage between 12.4 and 13.2 volts.

Operating Conditions

- Key switch in run position.
- Engine running.

Theory of Operation

The charging system consists of the G2 alternator with an integrated voltage regulator/rectifier. Charging output is controlled by the regulator/rectifier. The status of the charge rate is indicated by the display panel discharge light.

With the key switch in the run position, battery sensing circuit current flows through the key switch to the alternator voltage regulator/rectifier over the 072 Red wires. (See [Power Circuit Operation](#) in Section 50, Group 35.) for a description of the complete circuit to the battery positive terminal. The battery sensing circuit allows the voltage regulator/rectifier to monitor battery voltage.

A rotating winding (field) in the alternator induces AC current in the alternator stator coils. The AC current flows to the voltage regulator/rectifier. The voltage regulator/rectifier converts AC current to DC current needed to charge the battery.

If battery voltage is low (sensed via the 072 Red wires), the regulator/rectifier allows DC current to flow to the battery to charge it through the battery charging circuit (002A Red wire). When the battery is fully charged, the voltage regulator/rectifier stops current flow to the battery.

If the alternator output current falls below system usage or is insufficient to maintain a preset voltage, the voltage regulator/rectifier provides current to turn on the discharge light through the 334A Yel wire, X6 connector terminal A, and the display panel circuit board.

The alternator is grounded through the mounting hardware to the engine.

If the voltage regulator is grounded to the alternator cover, the alternator produces unregulated amperage. (See [Alternator Regulated Voltage Test](#) in Section 40, Group 40.)

KN52281,100438A -19-11JAN13-1/1

Tachometer Circuit Operation

Function:

To indicate engine rpm to the operator.

Operating Conditions:

- Key switch in run position, and
- Engine running.

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Theory of Operation:

Pulsed current flows from the “P” terminal of the alternator to the display panel (X10 connector, terminal F) through the 325C and 325B Grn wires.

When current is pulsed through the 325 Grn wires, the tachometer reads this input and displays the engine rpm speed.

Additionally, on eHydro™ machines, the 325A Grn wire supplies input pulses to the A2 drive controller to indicate to the controller the engine speed (X4 connector, terminal E).

KN52281,100438B -19-07DEC12-1/1

Tachometer Circuit Operation—MY13

Function

To indicate engine rpm to the operator.

Operating Conditions

- Key switch in run position.
- Engine running.

Theory of Operation

Pulsed current flows from the “P” terminal of the alternator to the display panel (X10 connector, terminal F) through the 325 Grn wires.

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When current is pulsed through the 325 Grn wires, the tachometer reads this input and displays the engine rpm speed.

Additionally, on eHydro™ machines, the 325D Grn wire supplies input pulses to the A2 drive controller to indicate to the controller the engine speed (X4 connector, terminal E).

AK82585,271AFF8 -19-16JAN13-1/1

Hour Meter Circuit Operation

Function

To indicate engine hours of use to the operator.

Operating Conditions

- Key switch in run position.
- Engine running.

Theory of Operation

The hour meter is integrated into the display panel and does not have any external wiring. The hour meter operates only when the engine is running. The hour meter uses the engine tachometer circuit for power. If the tachometer is not functioning, the hour meter will not work.

KN52281,100438C -19-11JAN13-1/1

Speedometer Circuit Operation (eHydro™)

Function

To indicate ground speed of the machine.

Operating Conditions

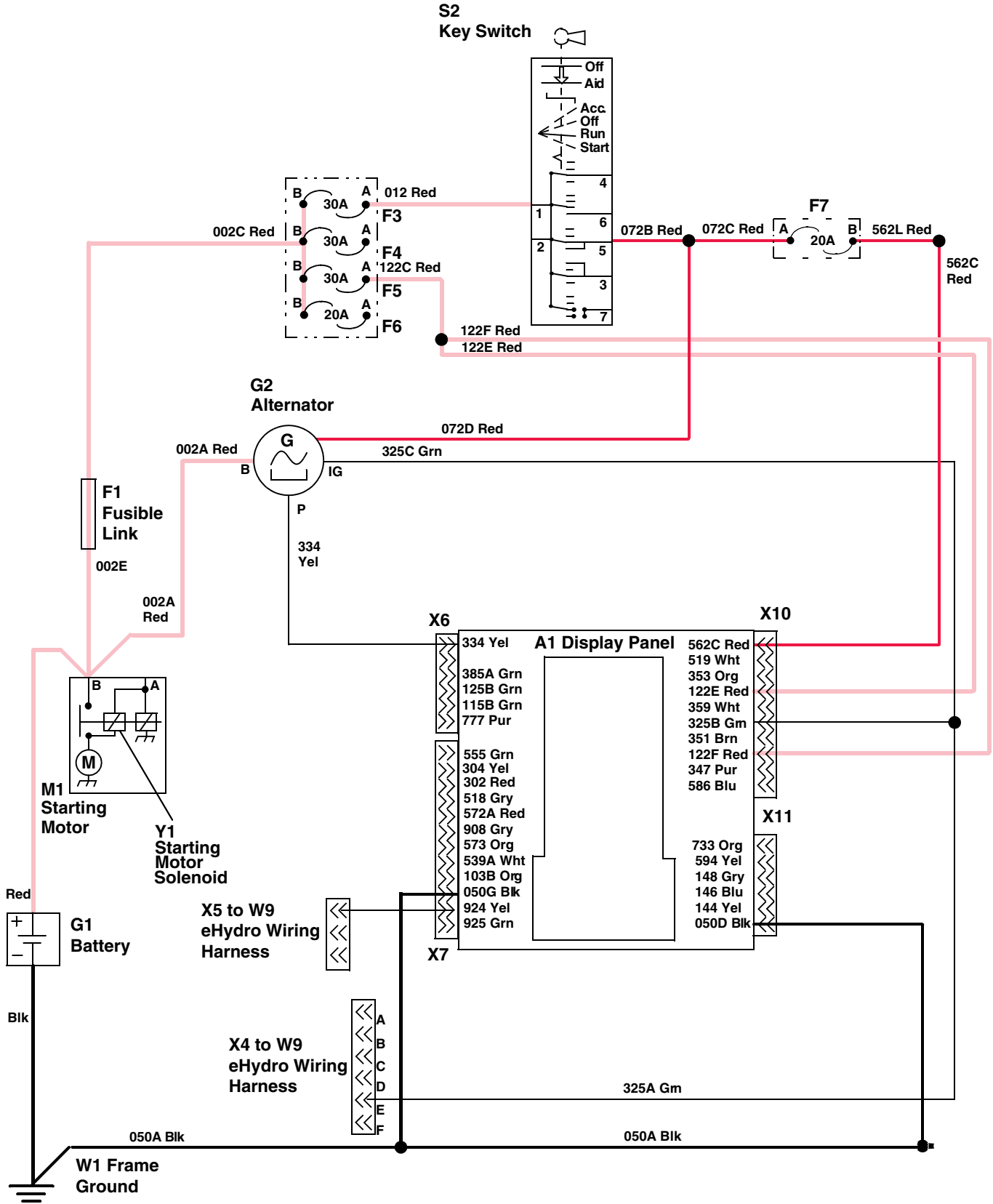
- Key switch in run position.
- Engine running with machine in motion.

Theory of Operation

The speedometer is integrated into the display panel and does not have any external wiring. The speedometer operates only when the engine is running and the machine is in motion. The speedometer uses the T3 MFWD speed sensor for a reference signal to indicate machine ground speed and inputs this signal to the A1 display panel over the 924A Yel wire (X5 connector, terminal A).

KN52281,100438D -19-11JAN13-1/1

Charge, Tachometer, Speedometer and Hour Meter Circuit Electrical Schematic—Pre MY08



LVAL11990 —UN—12NOV10

Continued on next page

KN52281,100438E -19-30OCT12-1/2

A1—Display Panel
F1—Fusible Link
F3—Fuse 30A
F4—Fuse 30A
F5—Fuse 30A
F6—Fuse 20A
F7—Fuse 20A
G1—Battery
G2—Alternator
M1—Starting Motor

S2—Key Switch
W1—Frame Ground
X4—W1 Main Wiring Harness to
W9 eHydro™ Wiring Harness
X5—W1 Main Wiring Harness
to W9 eHydro™ Wiring
Harness

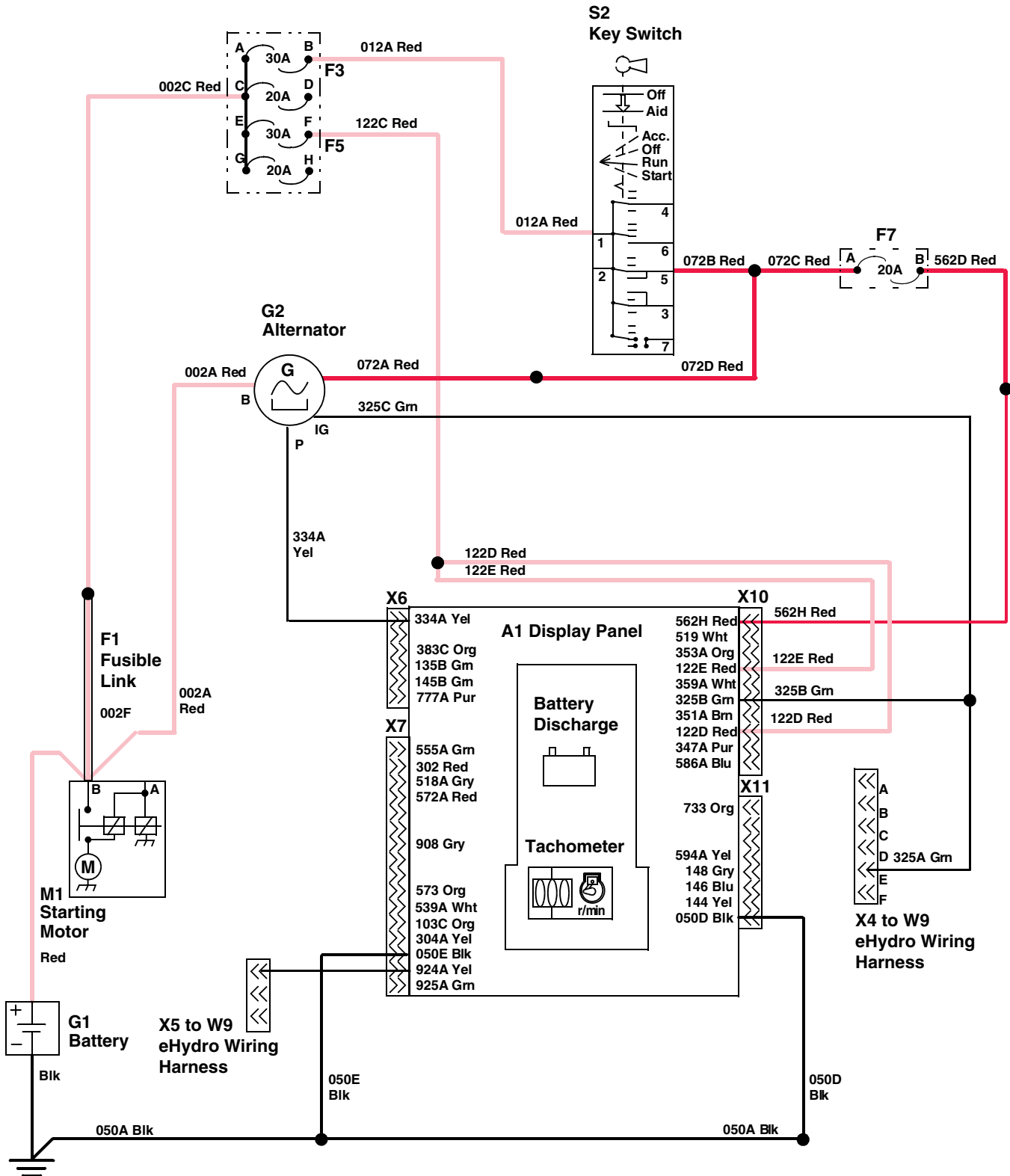
X6—W1 Main Wiring Harness to
A1 Display Panel
X7—W1 Main Wiring Harness to
A1 Display Panel
X10—W1 Main Wiring Harness
to A1 Display Panel

X11—W1 Main Wiring Harness
to A1 Display Panel
Y1—Starting Motor Solenoid

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KN52281,100438E -19-30OCT12-2/2

Charge, Tachometer, Speedometer and Hour Meter Circuit Electrical Schematic—MY08



LVAL11991 —UN—12NOV10

Continued on next page

KN52281,100438F -19-23OCT12-1/2

A1—Display Panel
F1—Fusible Link
F3—Fuse 30A
F5—Fuse 30A
F7—Fuse 20A
G1—Battery
G2—Alternator
M1—Starting Motor

S2—Key Switch
X4—W1 Main Wiring Harness to
W9 eHydro™ Wiring Harness
X5—W1 Main Wiring Harness
to W9 eHydro™ Wiring
Harness

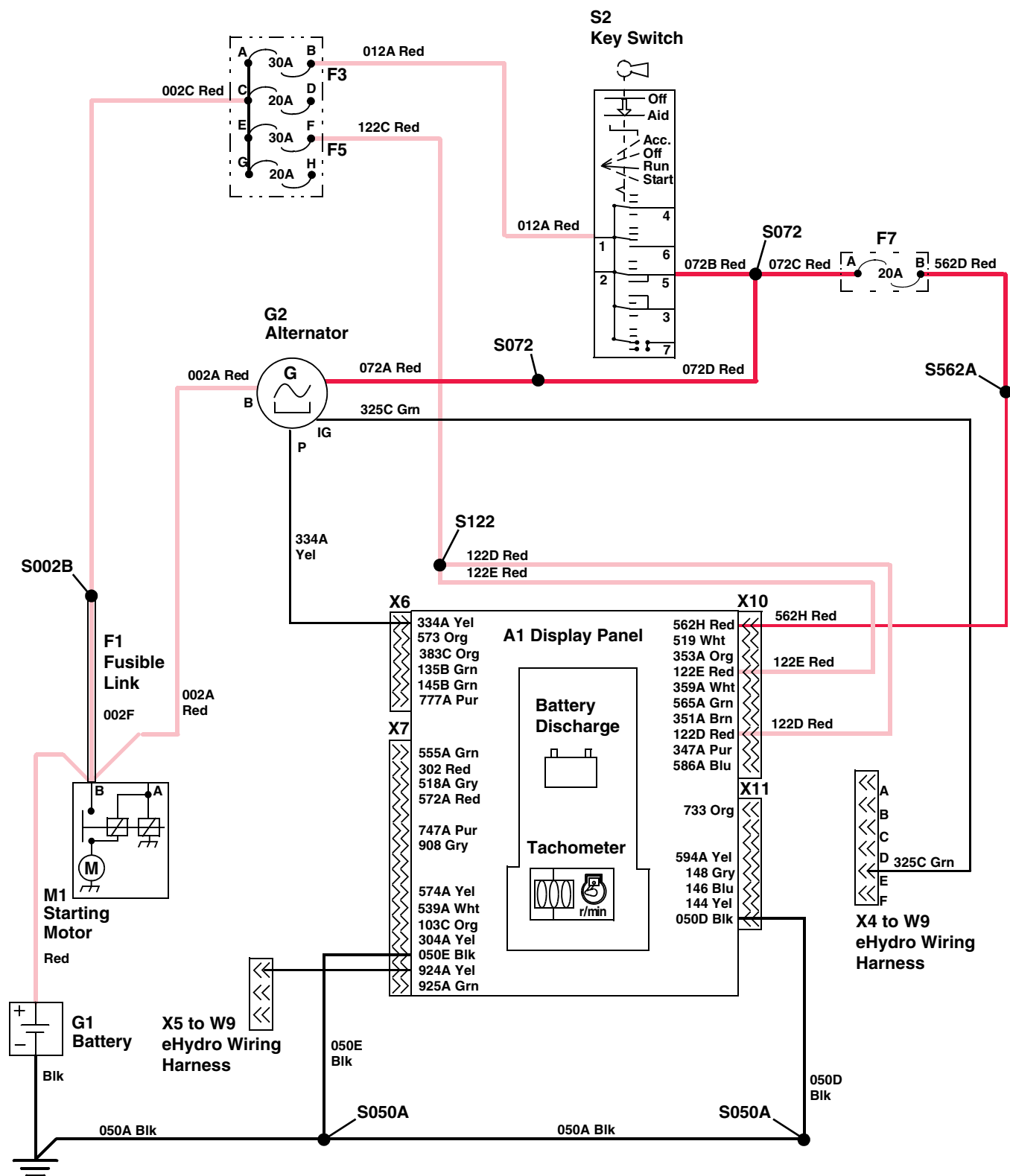
X6—W1 Main Wiring Harness to
A1 Display Panel
X7—W1 Main Wiring Harness to
A1 Display Panel
X10—W1 Main Wiring Harness
to A1 Display Panel

X11—W1 Main Wiring Harness
to A1 Display Panel

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KN52281,100438F -19-23OCT12-2/2

Charge, Tachometer, Speedometer and Hour Meter Circuit Electrical Schematic—MY13



LVAL38888 —UN—26NOV12

Continued on next page

KN52281,10043CC -19-11JAN13-1/2

A1—Display Panel
F1—Fusible Link
F3—Fuse 30A
F5—Fuse 30A
F7—Fuse 20A
G1—Battery
G2—Alternator
M1—Starting Motor

S2—Key Switch
X4—W1 Main Wiring Harness to
W9 Wiring Harness
X5—W1 Main Wiring Harness to
W9 Wiring Harness

X6—W1 Main Wiring Harness to
A1 Display Panel
X7—W1 Main Wiring Harness to
A1 Display Panel
X10—W1 Main Wiring Harness
to A1 Display Panel

X11—W1 Main Wiring Harness
to A1 Display Panel

KN52281,10043CC -19-11JAN13-2/2

Charge, Tachometer and Hour Meter Circuit Diagnosis

Test Procedure A

Test Conditions:

- Key switch in run position, engine running at low idle.
- Park brake locked.
- Transmission in neutral.
- PTO(s) off.
- Fully charged battery.

KN52281,1004390 -19-07DEC12-1/8

Charge System

KN52281,1004390 -19-07DEC12-2/8

Step 1

Is battery discharge indicator light illuminated?

YES: Test battery. (See [Battery—Load Test](#) in Section 40, Group 40.) Place battery on charge. (See [Battery—Charge](#) in Section 40, Group 40.) Go to next step.

NO: Go to next step.

KN52281,1004390 -19-07DEC12-3/8

Step 2

Does the tachometer display engine rpm?

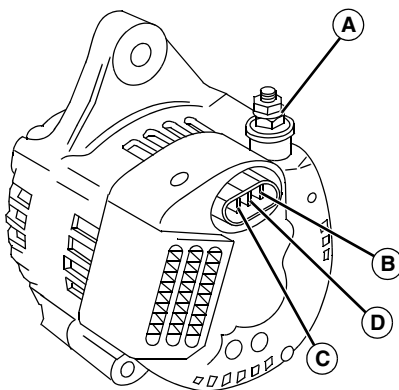
YES: Go to next step.

NO: Check 325C and 325B Grn wires and connections. If OK, remove and test alternator. (See [Alternator Removal and Installation](#) in Section 40, Group 60.)

Continued on next page

KN52281,1004390 -19-07DEC12-4/8

Step 3



LVAL11992 —UN—12NOV10

Alternator (eHydro™ shown)

- A—Alternator Terminal B1, 002A Red Wire**
- B—Alternator Terminal IG, 334 Yel Wire**
- C—Alternator Terminal P, 325C Grn Wire**
- D—Alternator Terminal 072A Red Wire**

Measure voltage at B1 terminal, 002A Red wire of alternator (A). Is reading 14.0 volts or greater?

YES: Go to next step.

NO: Test battery. (See [Battery—Load Test](#) in Section 40, Group 40.) Place battery on charge. (See [Battery—Charge](#) in Section 40, Group 40.) If OK, remove and test alternator. (See [Alternator Removal and Installation](#) in Section 40, Group 60.)

KN52281,1004390 -19-07DEC12-5/8

Step 4

Measure voltage at IG terminal, 334 Yel wire of alternator (B). Is reading 14.0 volts or greater?

YES: Go to next step.

NO: Remove and test alternator. (See [Alternator Removal and Installation](#) in Section 40, Group 60.)

KN52281,1004390 -19-07DEC12-6/8

Step 5

Measure voltage at P terminal, 325C Grn wire of alternator (C). Is reading 7.25 volts or greater?

YES: Go to next step.

NO: Remove and test alternator. (See [Alternator Removal and Installation](#) in Section 40, Group 60.)

KN52281,1004390 -19-07DEC12-7/8

Step 6

Measure voltage a 072A Red wire (D) of alternator. Is reading 14.0 volts or greater?

YES: Test complete.

NO: Check 072A, 072D, and 072B Red wires and power circuit. (See [Power Circuit Operation](#) in Section 50, Group 35.)

KN52281,1004390 -19-07DEC12-8/8

Charge, Tachometer and Hour Meter Circuit Diagnosis—MY13

Test Procedure A

Test Conditions

- Key switch in run position, engine running at low idle.
- Park brake locked.
- Transmission in neutral.
- PTO(s) off.
- Fully charged battery.

AK82585,271AF28 -19-21JAN13-1/8

Charge System

AK82585,271AF28 -19-21JAN13-2/8

Step 1

Is battery discharge indicator light illuminated?

YES: Test battery. (See [Battery—Load Test](#).) Place battery on charge. (See [Battery—Charge](#).) Go to next step.

NO: Go to next step.

AK82585,271AF28 -19-21JAN13-3/8

Step 2

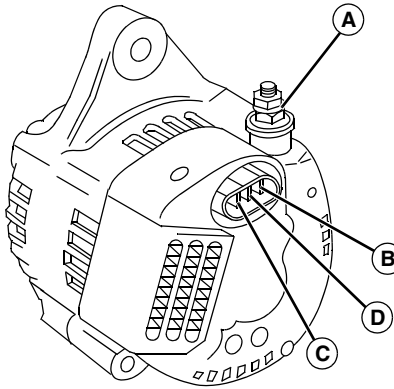
Does the tachometer display engine rpm?

YES: Go to next step.

NO: Check 325 wires and connections. If OK, remove and test alternator. (See [Alternator Removal and Installation](#).)

AK82585,271AF28 -19-21JAN13-4/8

Step 3



LVAL11992 —UN—12NOV10

Alternator (eHydro™ shown)

- A—Alternator Terminal B1, 002A Red Wire**
- B—Alternator Terminal IG, 334A Yel Wire**
- C—Alternator Terminal P, 325C Grn Wire**
- D—Alternator Terminal 072A Red Wire**

Measure voltage at B1 terminal, 002A Red wire of alternator (A). Is reading 14.0 volts or greater?

YES: Go to next step.

NO: Test battery. (See [Battery—Load Test](#).) Place battery on charge. (See [Battery—Charge](#).) If OK, remove and test alternator. (See [Alternator Removal and Installation](#).)

Continued on next page

AK82585,271AF28 -19-21JAN13-5/8

Operation and Diagnostics

Step 4	Measure voltage at IG terminal, 334A Yel wire of alternator (B). Is reading 14.0 volts or greater?	YES: Go to next step. NO: Remove and test alternator. (See Alternator Removal and Installation.)
AK82585,271AF28 -19-21JAN13-6/8		
Step 5	Measure voltage at P terminal, 325C Grn wire of alternator (C). Is reading 7.25 volts or greater?	YES: Go to next step. NO: Remove and test alternator. (See Alternator Removal and Installation.)
AK82585,271AF28 -19-21JAN13-7/8		
Step 6	Measure voltage a 072A Red wire (D) of alternator. Is reading 14.0 volts or greater?	YES: Test complete. NO: Check 072A, 072D, and 072B Red wires and power circuit. (See Power Circuit Operation.)
AK82585,271AF28 -19-21JAN13-8/8		

Rear and Mid PTO Circuit Operations

Rear PTO Function:

To engage the rear PTO and illuminate a light on the display panel to alert the operator that the rear PTO is on.

Operating Conditions:

- Key switch in run or start position
- Operator on seat, or off seat if the off seat PTO logic is activated. (See [Fuel Supply/Engine Shutoff Circuit Operation](#).)
- Rear PTO switch on

Theory of Operation:

The rear PTO switch is used as an interlock to the fuel supply circuit as well as engaging the rear PTO.

In the off (normally closed) position the rear PTO switch supplies current to the fuel supply circuit through the A1 display panel. If the rear PTO is on and the operator leaves the seat, current is removed from the fuel supply circuit unless the off seat PTO logic is activated.

With the key in start or run position, battery voltage is provided to the S4 rear PTO switch through the S2 key switch, 072B Red wires, F7 fuse, and 562 Red wires.

With the PTO on, the rear PTO switch is in the on (open) position, and voltage is supplied across the rear PTO switch (terminals 1 and 4) from the 562 Red wire to the 574 Yel wire. The 574 Yel wire supplies current to the Y3 rear PTO solenoid to energize the solenoid and engage the rear PTO.

The ground circuit for the rear PTO solenoid is provided through the 010 Blk wires.

At the same time power is removed from the 573 Org wire which supplies current to the A1 display panel through the X7 connector (terminal K). The display panel logic reads the power being removed from this input and turns on the rear PTO indicator light. Additionally, the display panel checks for the proper inputs from the other switches. If the seat switch is closed (operator on seat) then the display panel will continue to provide an output to the fuel hold-in solenoid. If the operator is off the seat, then the off seat PTO logic must be active before the rear PTO switch is placed in the on position or the display panel will remove power to the fuel hold-in solenoid. (See [Fuel Supply/Engine Shutoff Circuit Operation](#) in Section 50, Group 35.)

A ground circuit path for the display panel is provided through the X7 connector (terminal P) 050 Blk wire and

X11 connector (terminal H) 050 Blk wire, both spliced into the 050A Blk wire to frame ground.

Mid PTO Function:

To engage the mid PTO and illuminate a light on the display panel to alert the operator that the mid PTO is on.

Operating Conditions:

- Key switch in run or start position,
- Operator on seat, and
- Mid PTO switch on.

Mid PTO Theory of Operation:

The mid PTO switch is used as an interlock to the fuel supply circuit as well as engaging the mid PTO.

In the off (normally closed) position the mid PTO switch supplies current to the fuel supply circuit through the A1 display panel. If the mid PTO is on and the operator leaves the seat, current is removed from the fuel supply circuit.

With the key in the start or run position, battery voltage is provided to the S9 mid PTO switch through the S2 key switch, 072 Red wires, F7 fuse, and 562 Red wires.

With the PTO on, the mid PTO switch is in the on (open) position, and voltage is removed from the 594 Yel wire at the A1 display panel. This will indicate to the display panel that the mid PTO is engaged. The mid PTO indicator on the dash panel will illuminate.

The display panel checks for the proper inputs from the other switches. If the seat switch is closed (operator on seat) then the display panel will continue to provide an output to the fuel hold-in solenoid. If the operator is off the seat, the display panel will remove power to the fuel hold-in solenoid, shutting off the engine.

A ground circuit path for the display panel is provided through the X7 connector (terminal P) 050 Blk wire and X11 connector (terminal H) 050 Blk wire, both spliced into the 050A Blk wire to frame ground.

The rear PTO can be used simultaneously with the mid PTO, but only with the operator on the seat. The S7 rear PTO switch is closed when both of the PTOs are selected. The 777 Pur wire, power supplied through the closed S7 switch by the 562 Red wire, will send the display panel (X6 connector, terminal F) battery voltage, along with the lack of signal at the 594 Yel wire, to indicate that both the mid and rear PTOs are engaged. This will illuminate the PTO indicator lights. These lights will flash or remain on constantly depending PTO selection combinations.

PTO Indicator Light Display Combinations:

Input/PTO Switch Position	Rear PTO Light	Mid PTO Light
(B+) Rear PTO ON—(B+) Mid PTO OFF	Solid ON	OFF
(Gnd) Rear PTO OFF—(Gnd) Mid PTO ON	OFF	Solid ON
(B+) Rear PTO ON—(Gnd) Mid PTO ON	FLASHING	FLASHING
(Gnd) Rear PTO OFF—(B+) Mid PTO OFF	OFF	OFF

KN52281,1004391 -19-18DEC12-2/2

Rear and Mid PTO Circuit Operation—MY13

Rear PTO Function

To engage the rear PTO and illuminate a light on the display panel to alert the operator that the rear PTO is on.

Operating Conditions

- Key switch in run or start position.
- Operator on seat, or off seat if the off seat PTO logic is activated. (See Fuel Supply/Engine Shutoff Circuit Operation.)
- Rear PTO switch on.

Rear PTO Theory of Operation

The rear PTO switch is used as an interlock to the fuel supply circuit as well as engaging the rear PTO.

In the off (normally closed) position the rear PTO switch supplies current to the fuel supply circuit through the A1 display panel. If the rear PTO is on and the operator leaves the seat, current is removed from the fuel supply circuit unless the off seat PTO logic is activated.

With the key switch in start or run position, battery voltage is provided to the S4 rear PTO switch through the S2 key switch, 072B and 072C Red wires, F7 fuse, and 562D and 562A Red wires.

With the PTO on, the rear PTO switch is in the on (open) position, and voltage is supplied across the rear PTO switch (terminals 1 and 4) from the 562A Red wire to the 574A Yel wire. The 574 Yel wire supplies current to the display panel through X7 connector (terminal K). The display panel reads that power is needed for the rear PTO solenoid. Logic inside the cluster determines if the inputs meet the requirements for energizing the PTO solenoid in a safe manner. Any disallowed state immediately turns off the fuel shutoff solenoid. If all of the requirements are met current will be sent to the PTO indicator light and to the X7 connector (terminal F) 747A Pur wire, which energizes the Y3 rear PTO solenoid and engages the rear PTO.

The ground circuit for the rear PTO solenoid is provided through the 010M and 010P Blk wires.

A ground circuit path for the display panel is provided through the X7 connector (terminal P) 050E Blk wire and X11 connector (terminal H) 050D Blk wire, both spliced into the 050A Blk wire to frame ground.

Mid PTO Function

To engage the mid PTO and illuminate a light on the display panel to alert the operator that the mid PTO is on.

Operating Conditions

- Key switch in run or start position.

- Operator on seat.
- Mid PTO switch on.

Mid PTO Theory of Operation

The mid PTO switch is used as an interlock to the fuel supply circuit as well as engaging the mid PTO.

In the off (normally closed) position the mid PTO switch supplies current to the fuel supply circuit through the A1 display panel. If the mid PTO is on and the operator leaves the seat, current is removed from the fuel supply circuit.

With the key in the start or run position, battery voltage is provided to the S9 mid PTO switch through the S2 key switch, 072B and 072D Red wires, F7 fuse, and 562D, 562N, and 562L Red wires.

With the PTO on, the mid PTO switch is in the on (open) position, and voltage is removed from the 594 Yel wire at the A1 display panel. This will indicate to the display panel that the mid PTO is engaged. The mid PTO indicator on the dash panel will illuminate.

The display panel checks for the proper inputs from the other switches. If the seat switch is closed (operator on seat), then the display panel will continue to provide an output to the fuel hold-in solenoid. If the operator is off the seat, the display panel will remove power to the fuel hold-in solenoid, shutting off the engine.

A ground circuit path for the display panel is provided through the X7 connector (terminal P) 050 Blk wire and X11 connector (terminal H) 050 Blk wire, both spliced into the 050A Blk wire to frame ground.

The rear PTO can be used simultaneously with the mid PTO, but only with the operator on the seat. The S7 rear PTO switch is closed when both of the PTOs are selected. The 777A Pur wire, power supplied through the closed S7 switch by the 562E Red wire, will send the display panel (X6 connector, terminal F) battery voltage, along with the lack of signal at the 594A Yel wire, to indicate that both the mid and rear PTOs are engaged. This will illuminate the PTO indicator lights. These lights will flash or remain on constantly depending on PTO selection combinations.

The RIO position of the PTO switch allows the operator to operate mid mount implement while the tractor is traveling in the reverse direction. This function must be selected before each time the tractor is placed in reverse.

With the PTO switch pulled to the RIO position, current is supplied across the rear PTO switch (terminals 3 and 6) from the 562H Red wire to the 573 Org wire to the A1 display panel X6 connector (terminal B). Logic inside the cluster determines if the inputs are met, thus allowing mid PTO to operate while the tractor is traveling in reverse direction.

PTO Indicator Light Display Combinations

Input/PTO Switch Position	Rear PTO Light Light Condition	Mid PTO Light Light Condition
(B+) Rear PTO ON—(B+) Mid PTO OFF	Solid ON	OFF
(Gnd) Rear PTO OFF—(Gnd) Mid PTO ON	OFF	Solid ON
(B+) Rear PTO ON—(Gnd) Mid PTO ON	FLASHING	FLASHING
(B+) RIO PTO ON—(Gnd) Mid PTO ON	OFF	FLASHING
(Gnd) Rear PTO OFF—(B+) Mid PTO OFF	OFF	OFF

AK82585,271AF33 -19-11JAN13-2/2

Front PTO Circuit Operation**Function:**

To engage the front PTO and illuminate a light on the display panel to alert the operator that the rear PTO is on.

Operating Conditions:

- Key switch in run or start position.
- Operator on seat, or off seat if the off seat PTO logic is activated. (See Fuel Supply/Engine Shutoff Circuit Operation in Section 50, Group 35.)
- Rear PTO switch on.

Theory of Operation:

The front PTO switch is used as an interlock to the fuel supply circuit as well as engaging the front PTO.

In the off (normally closed) position the front PTO switch supplies current to the fuel supply circuit through the A1 display panel. If the front PTO is on and the operator leaves the seat, current is removed from the fuel supply circuit unless the off seat PTO logic is activated.

With the key in start or run position, battery voltage is provided to the S21 front PTO switch through the S1 key switch, 072 Red wires, F7 fuse, and 562 Red wires.

With the PTO on, the front PTO switch is in the on (open) position, and voltage is supplied across the rear PTO switch (terminals 1 and 4) from the 562 Red wire to the 737 Pur wire. The 737 Pur wire supplies current to the Y6 front PTO clutch to energize the clutch and engage the front PTO.

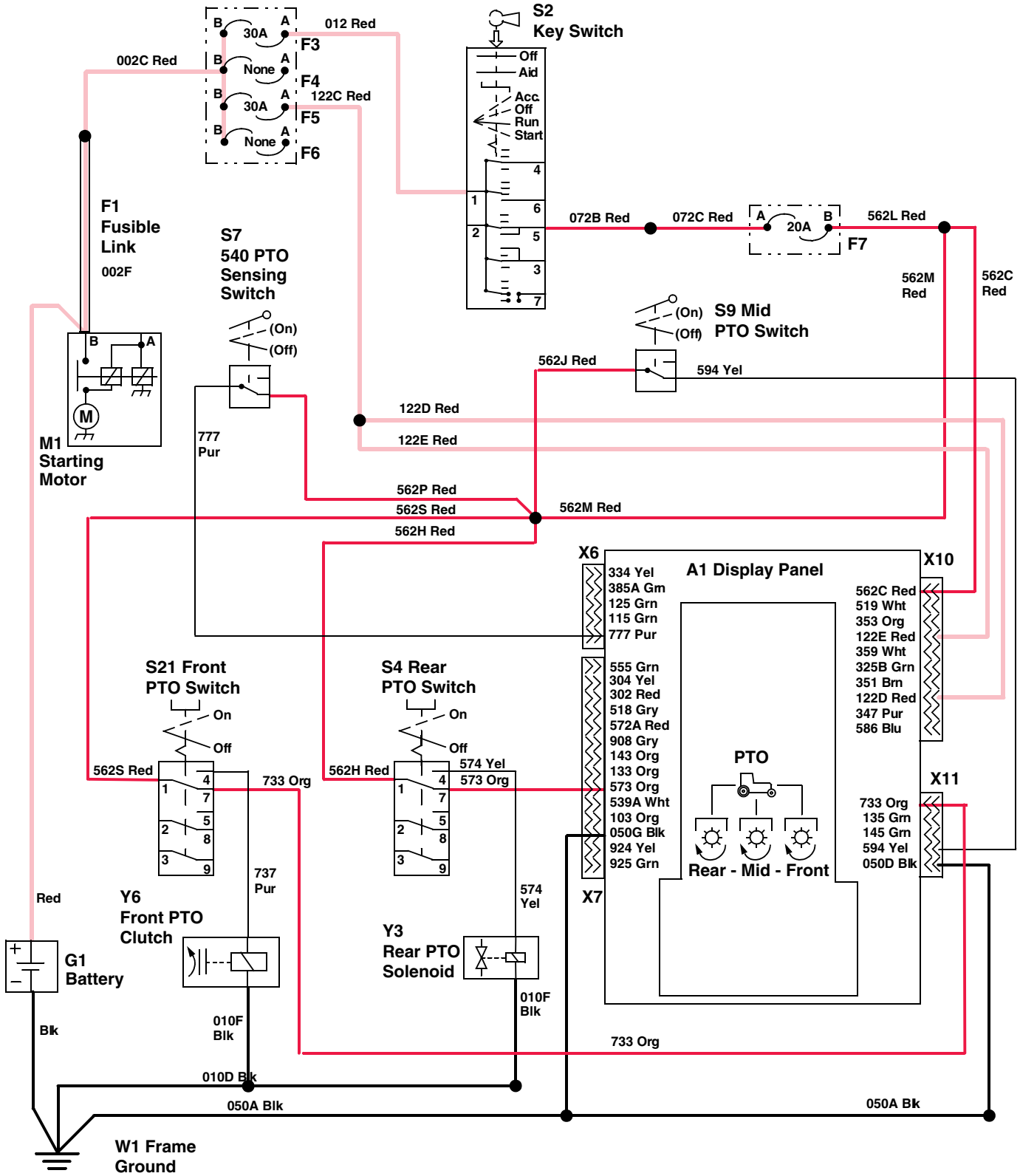
The ground circuit is provided by the 010 Blk wires.

At the same time power is removed from the 733 Org wire which supplies current to the A1 display panel through the X11 connector (terminal A). The display panel logic reads the power being removed from this input and turns on the front PTO indicator light. Additionally, the display panel checks for the proper inputs from the other switches. If the seat switch is closed (operator on seat) then the display panel will continue to provide an output to the fuel hold-in solenoid. If the operator is off the seat, then the off seat PTO logic must be active before the front PTO switch is placed in the on position or the display panel will remove power to the fuel hold-in solenoid.

A ground circuit path for the display panel is provided though the X7 connector (terminal P) 050 Blk wire and X11 connector (terminal H) 050 Blk wire, both spliced into the 050A Blk wire to frame ground.

KN52281,1004392 -19-11JAN13-1/1

PTO Circuit Electrical Schematic—Pre MY08



LVAL11993—UN—12NOV10

Continued on next page

KN52281,1004393 -19-30OCT12-1/2

A1—Display Panel
F1—Fusible Link
F3—Fuse 30A
F4—Fuse 30A
F5—Fuse 30A
F6—Fuse 20A
F7—Fuse 20A
G1—Battery
M1—Starting Motor

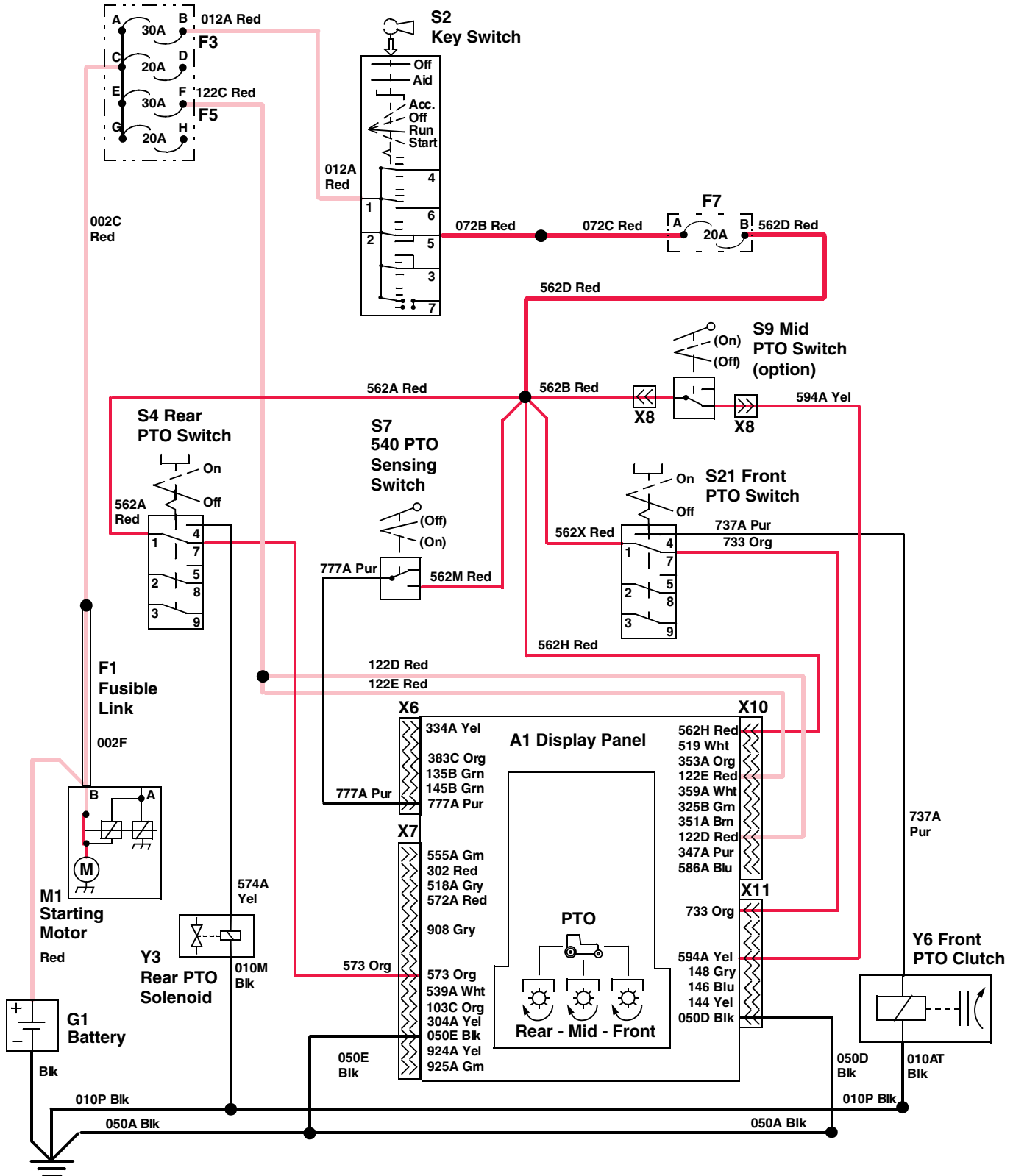
S2—Key Switch
S4—Rear PTO Switch
S7—PTO Switch Sensing Switch
S9—Mid PTO Switch
S21—Front PTO Switch
W1—Frame Ground

X6—W1 Main Wiring Harness to
A1 Display Panel
X7—W1 Main Wiring Harness to
A1 Display Panel
X10—W1 Main Wiring Harness
to A1 Display Panel

X11—W1 Main Wiring Harness
to A1 Display Panel
Y3—Rear PTO Solenoid
Y6—Front PTO Clutch

KN52281,1004393 -19-30OCT12-2/2

PTO Circuit Electrical Schematic—MY08



LVAL11994 —UN—12NOV10

Continued on next page

KN52281,1004394 -19-23OCT12-1/2

A1—Display Panel	S7— PTO Switch Sensing Switch	X8— W1 Main Wiring Harness to	Y3—Rear PTO Solenoid
F1— Fusible Link	S9— Mid PTO Switch (optional)	W3 Jumper Plug (standard),	Y6— Front PTO Clutch
F3— Fuse 30A	S21— Front PTO Switch	S9 Mid PTO Switch (optional)	
F5— Fuse 30A	X6— W1 Main Wiring Harness to	X10— W1 Main Wiring Harness	
F7— Fuse 20A	A1 Display Panel	to A1 Display Panel	
G1—Battery	X7— W1 Main Wiring Harness to	X11— W1 Main Wiring Harness	
M1—Starting Motor	A1 Display Panel	to A1 Display Panel	
S2— Key Switch			
S4— Rear PTO Switch			

KN52281,1004394 -19-23OCT12-2/2

PTO Circuit Electrical Schematic—MY13



KN52281,10043CD -19-11JAN13-1/2

A1—Display Panel	S7—Rear PTO Switch Sensing Switch	X8—W1 Main Wiring Harness to W3 Jumper Plug (standard), S9 Mid PTO Switch (optional)	Y3—Rear PTO Solenoid
F1—Fusible Link	S9—Mid PTO Switch (optional)	X10—W1 Main Wiring Harness to A1 Display Panel	Y6—Front PTO Clutch
F3—Fuse 30A	S21—Front PTO Switch	X11—W1 Main Wiring Harness to A1 Display Panel	
F5—Fuse 30A	X6—W1 Main Wiring Harness to A1 Display Panel		
F7—Fuse 20A	X7—W1 Main Wiring Harness to A1 Display Panel		
G1—Battery			
M1—Starting Motor			
S2—Key Switch			
S4—Rear PTO Switch			

KN52281,10043CD -19-11JAN13-2/2

Rear and Mid PTO Circuit Diagnosis Pre MY08/MY08

Test Procedure A

Test Conditions:

- Right rear wheel removed for easier access to rear PTO solenoid.

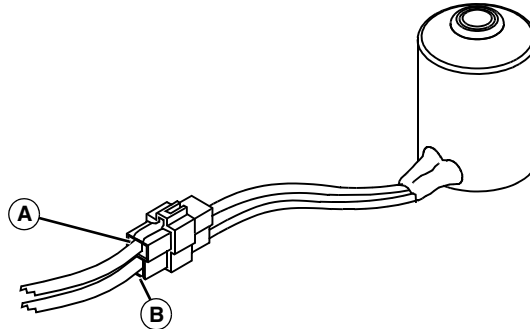
- Park brake locked.
- Transmission in neutral.
- Key switch in run position, engine running.
- Operator off seat, off seat PTO logic activated, (See [Fuel Supply/Engine Shutoff Circuit Operation.](#))
- Rear PTO on.

KN52281,1004395 -19-18DEC12-1/11

Rear PTO Solenoid Test

KN52281,1004395 -19-18DEC12-2/11

Step 1



LVAL11995 —UN—12NOV10

A—Y3 Rear PTO Solenoid, 574 Yel Wire
B—Y3 Rear PTO Solenoid, 010 Blk Wire

Is battery voltage present at the Y3 rear PTO solenoid, 574 Yel wire (A)?

YES: Go to next step.

NO: Test rear PTO switch. Check 574 Yel wire and connections.

KN52281,1004395 -19-18DEC12-3/11

Step 2

Is continuity to ground present at the Y3 rear PTO solenoid, 010 Blk wire (B)?

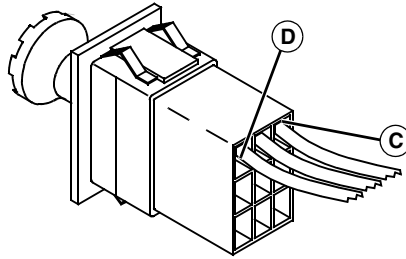
YES: Test rear PTO solenoid. (See [Rear PTO Solenoid Tests.](#)) If ok, and rear PTO does not function, see "PTO Repair" in Final Drive section.

NO: Check 010 Blk wires and connections.

Continued on next page

KN52281,1004395 -19-18DEC12-4/11

Step 3



LVAL11996 —UN—12NOV10

C—S4 Rear PTO Switch, 562 Red Wire
D—S4 Rear PTO Switch, 573 Org Wire

Is battery voltage present at the S4 rear PTO switch, 562 Red wire (C)?

YES: Go to next step.

NO: Test switched power circuit. (See [Power Circuit Diagnosis](#).)

KN52281,1004395 -19-18DEC12-5/11

Step 4

Is battery voltage present at the S4 rear PTO switch, 573 Org wire (D)?

YES: Check PTO logic. Test PTO switch. Replace rear PTO switch as needed.

NO: Go to next step.

KN52281,1004395 -19-18DEC12-6/11

Step 5

Is rear PTO light illuminated on display panel?

YES: Test complete. If rear PTO does not function, See PTO Test in Final Drive section.

NO: Replace display panel.

KN52281,1004395 -19-18DEC12-7/11

Test Procedure B

Test Conditions:

- Park brake off.

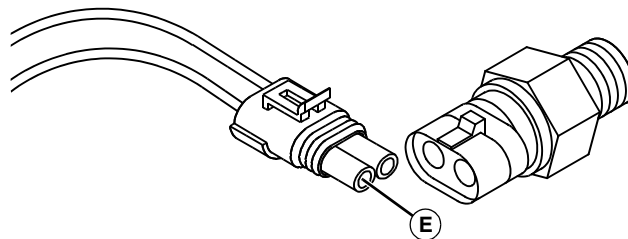
- Transmission in neutral.
- Key switch in run position, engine running.
- Operator on seat.
- Mid PTO on.

KN52281,1004395 -19-18DEC12-8/11

Mid PTO Switch Test

KN52281,1004395 -19-18DEC12-9/11

Step 1



LVAL11997 —UN—12NOV10

E—S9 Mid PTO Switch, 562 Red Wire

Is battery voltage present at 562 Red wire (E) of S9 mid PTO switch?

YES: Go to next step.

NO: Check 562 Red wires and connections. Check switched power circuit. (See [Power Circuit Operation](#).)

Continued on next page

KN52281,1004395 -19-18DEC12-10/11

Step 2

Is battery voltage present at 594 Yel wire of A1 display panel?

YES: Check that mid PTO switch is ON. Test switch.
NO: Replace switch as needed.

KN52281,1004395 -19-18DEC12-11/11

Rear and Mid PTO Circuit Diagnosis—MY13

Test Procedure A

Test Conditions

- Right rear wheel removed for easier access to rear PTO solenoid.

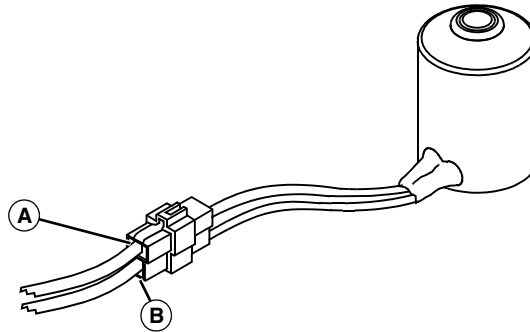
- Park brake locked.
- Transmission in neutral.
- Key switch in run position, engine running.
- Operator off seat, off seat PTO logic activated, (See [Fuel Supply/Engine Shutoff Circuit Operation.](#))
- Rear PTO on.

AK82585,271AF2A -19-21JAN13-1/12

Rear PTO Solenoid Test

AK82585,271AF2A -19-21JAN13-2/12

Step 1



LVAL11995 —UN—12NOV10

A—Y3 Rear PTO Solenoid, 747A Yel Wire
B—Y3 Rear PTO Solenoid, 010M Blk Wire

Is battery voltage present at the Y3 rear PTO solenoid, 747A Yel wire (A)?

YES: Go to next step.

NO: Test rear PTO switch. Check 747A Yel wire and connections.

AK82585,271AF2A -19-21JAN13-3/12

Step 2

Is continuity to ground present at the Y3 rear PTO solenoid, 010M Blk wire (B)?

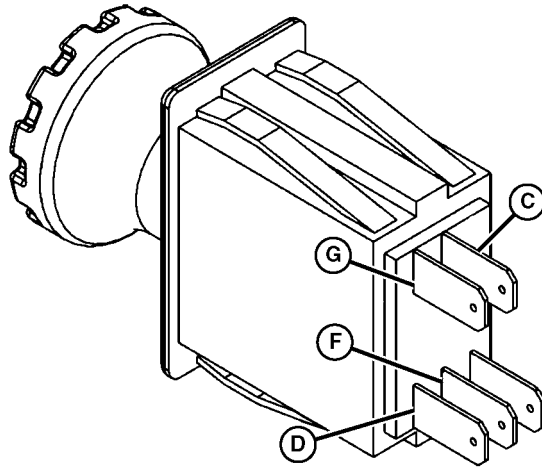
YES: Test rear PTO solenoid. (See [Rear PTO Solenoid Tests.](#)) If ok, and rear PTO does not function, see "PTO Repair" in Final Drive section.

NO: Check 010 Blk wires and connections.

Continued on next page

AK82585,271AF2A -19-21JAN13-4/12

Step 3



LVAL38964 —UN—17JAN13

C—S4 Rear PTO Switch, 562A Red Wire
D—S4 Rear PTO Switch, 573 Org Wire
E—S4 Rear PTO Switch, 574A Yel Wire

Is battery voltage present at the S4 rear PTO switch, 562A Red wire (C)?

YES: Go to next step.

NO: Test switched power circuit. (See [Power Circuit Diagnosis](#).)

AK82585,271AF2A -19-21JAN13-5/12

Step 4

Is battery voltage present at the S4 rear PTO switch, 574A Yel wire (D)?

YES: Check PTO logic. Test PTO switch. Replace rear PTO switch as needed.

NO: Go to next step.

AK82585,271AF2A -19-21JAN13-6/12

Step 5

When rear PTO switch is pulled to the RIO position is battery voltage present at the S4 Rear PTO switch 573 Org (D) wire.

YES: Go to next step.

NO: Replace rear PTO switch.

AK82585,271AF2A -19-21JAN13-7/12

Step 6

Is rear PTO light illuminated on display panel?

YES: Test complete. If rear PTO does not function, See PTO Test in Final Drive section.

NO: Replace display panel.

AK82585,271AF2A -19-21JAN13-8/12

Test Procedure B

Test Conditions

- Park brake off.

- Transmission in neutral.
- Key switch in run position, engine running.
- Operator on seat.
- Mid PTO on.

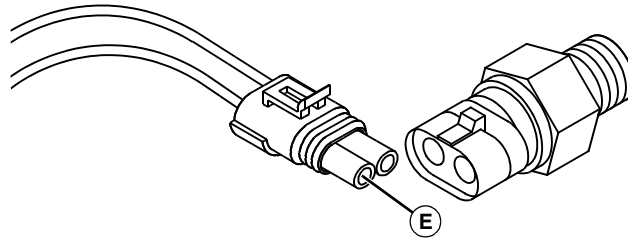
AK82585,271AF2A -19-21JAN13-9/12

Mid PTO Switch Test

Continued on next page

AK82585,271AF2A -19-21JAN13-10/12

Step 1



LVAL11997 —UN—12NOV10

E—S9 Mid PTO Switch, 562L Red Wire

Is battery voltage present at 562L Red wire (E) of S9 mid PTO switch?

YES: Go to next step.

NO: Check 562 Red wires and connections. Check switched power circuit. (See [Power Circuit Operation](#).)

AK82585,271AF2A -19-21JAN13-11/12

Step 2

Is battery voltage present at 594A Yel wire of A1 display panel?

YES: Check that mid PTO switch is ON. Test switch.

NO: Replace switch as needed.

AK82585,271AF2A -19-21JAN13-12/12

Front PTO Circuit Diagnosis

Test Procedure A

Test Conditions:

- Park brake locked.

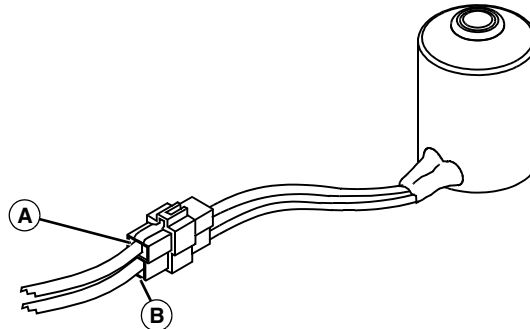
- Transmission in neutral.
- Key switch in run position, engine running.
- Operator off seat, off seat PTO logic activated, (See [Fuel Supply/Engine Shutoff Circuit Operation](#).)
- Front PTO on.

KN52281,1004396 -19-18DEC12-1/7

Front PTO Clutch Test

KN52281,1004396 -19-18DEC12-2/7

Step 1



LVAL11998 —UN—12NOV10

A—Y6 Front PTO Clutch, 737 Pur Wire

B—Y6 Front PTO Clutch, 010 Blk Wire

Is battery voltage present at the Y6 front PTO clutch, 737 Pur wire (A)?

YES: Go to next step.

NO: Check that front PTO switch is ON. Test front PTO switch. Check 737 Pur wire and connections.

Continued on next page

KN52281,1004396 -19-18DEC12-3/7

Step 2	<p>Is continuity to ground present at the Y6 front PTO clutch, 010 Blk wire (B)?</p>	<p>YES: Test front PTO clutch. (See Rear PTO Solenoid Tests.) If OK, and front PTO does not function, see “PTO Repair” in Final Drive Section.</p> <p>NO: Check 010 Blk wires and connections.</p> <p>KN52281,1004396 -19-18DEC12-4/7</p>
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Step 3	<div> <p>The diagram shows a mechanical switch assembly. Terminal C is labeled on a curved contact arm, and terminal D is labeled on a fixed contact point. The switch is mounted on a base with a gear-like component on the left.</p> </div> <p>LVAL11999 —UN—12NOV10 C—S21 Front PTO Switch, 562 Red Wire D—S21 Front PTO Switch, 733 Org Wire</p> <p>Is battery voltage present at the S21 front PTO switch, 562 Red wire (C)?</p>	<p>YES: Go to next step.</p> <p>NO: Test switched power circuit. (See Power Circuit Diagnosis.)</p> <p>KN52281,1004396 -19-18DEC12-5/7</p>
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Step 4	<p>Is battery voltage present at the S21 front PTO switch, 733 Org wire (D)?</p>	<p>YES: Check that front PTO switch is ON. Test front PTO switch. Replace front PTO switch.</p> <p>NO: Go to next step.</p> <p>KN52281,1004396 -19-18DEC12-6/7</p>
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Step 5	<p>Is front PTO light illuminated on display panel?</p>	<p>YES: Test complete. If front PTO does not function, see “PTO Repair” in Final Drive section.</p> <p>NO: Replace display panel.</p> <p>KN52281,1004396 -19-18DEC12-7/7</p>
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Front PTO Circuit Diagnosis—MY13

Test Procedure A

Test Conditions

- Park brake locked.

- Transmission in neutral.
- Key switch in run position, engine running.
- Operator off seat, off seat PTO logic activated, (See [Fuel Supply/Engine Shutoff Circuit Operation.](#))
- Front PTO on.

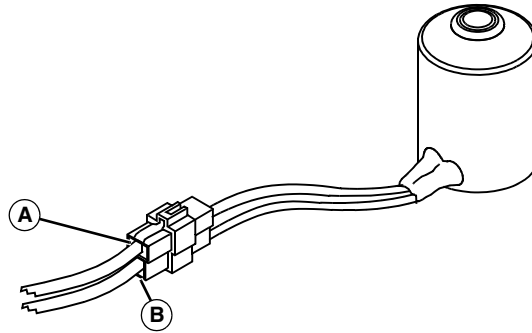
AK82585,271AF2B -19-21JAN13-1/7

Front PTO Clutch Test

Continued on next page

AK82585,271AF2B -19-21JAN13-2/7

Step 1



LVAL11998 —UN—12NOV10

A—Y6 Front PTO Clutch, 737A Pur Wire
B—Y6 Front PTO Clutch, 010AT Blk Wire

Is battery voltage present at the Y6 front PTO clutch, 737A Pur wire (A)?

YES: Go to next step.

NO: Check that front PTO switch is ON. Test front PTO switch. Check 737A Pur wire and connections.

AK82585,271AF2B -19-21JAN13-3/7

Step 2

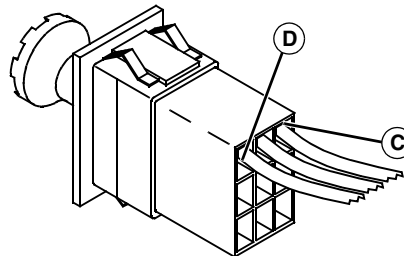
Is continuity to ground present at the Y6 front PTO clutch, 010AT Blk wire (B)?

YES: Test front PTO clutch. (See [Rear PTO Solenoid Tests](#).) If ok, and front PTO does not function, see "PTO Repair" in Final Drive Section.

NO: Check 010 Blk wires and connections.

AK82585,271AF2B -19-21JAN13-4/7

Step 3



LVAL11999 —UN—12NOV10

C—S21 Front PTO Switch, 562X Red Wire
D—S21 Front PTO Switch, 733 Org Wire

Is battery voltage present at the S21 front PTO switch, 562X Red wire (C)?

YES: Go to next step.

NO: Test switched power circuit. (See [Power Circuit Diagnosis](#).)

AK82585,271AF2B -19-21JAN13-5/7

Step 4

Is battery voltage present at the S21 front PTO switch, 733 Org wire (D)?

YES: Check that front PTO switch is ON. Test front PTO switch. Replace front PTO switch.

NO: Go to next step.

Continued on next page

AK82585,271AF2B -19-21JAN13-6/7

Step 5

Is front PTO light illuminated on display panel?

YES: Test complete. If front PTO does not function, see "PTO Repair" in Final Drive section.

NO: Replace display panel.

AK82585,271AF2B -19-21JAN13-7/7

MFWD Circuit Operation

Function:

To illuminate a light on the display panel to alert the operator that the MFWD is engaged.

Operating Conditions:

- Key switch in run position, and
- MFWD lever in the engaged position, MFWD engagement sensing switch on.

Theory of Operation:

The MFWD function is a mechanical system that uses a ball switch to turn a light on or off on the display panel to alert the operator that the MFWD is engaged.

With the key in start or run position, battery voltage is provided to the MFWD engagement sensing switch through the S2 key switch, 072 Red wires, F7 fuse and 562 Red wires to the MFWD engagement sensing switch.

When the MFWD lever is pulled up to the engaged position, the ball of the switch is pushed in to close the contacts inside the switch. With the switch contacts closed, current flows across the MFWD engagement sensing switch to the 555 Grn wire and X7 connector (terminal A) to the A1 display panel to illuminate the MFWD indicator light.

A ground circuit path for the display panel is provided though the X7 connector (terminal P) 050G Blk wire and X11 connector (terminal H) 050D Blk wire, both spliced into the 050A Blk wire.

KN52281,1004397 -19-23OCT12-1/1

MFWD Circuit Operation—MY13

Function

To illuminate a light on the display panel to alert the operator that the MFWD is engaged.

Operating Conditions

- Key switch in run position.
- MFWD lever in the engaged position, MFWD engagement sensing switch on.

Theory of Operation

The MFWD function is a mechanical system that uses a ball switch to turn a light on or off on the display panel to alert the operator that the MFWD is engaged.

With the key switch in START or RUN position, battery voltage is provided to the MFWD engagement sensing

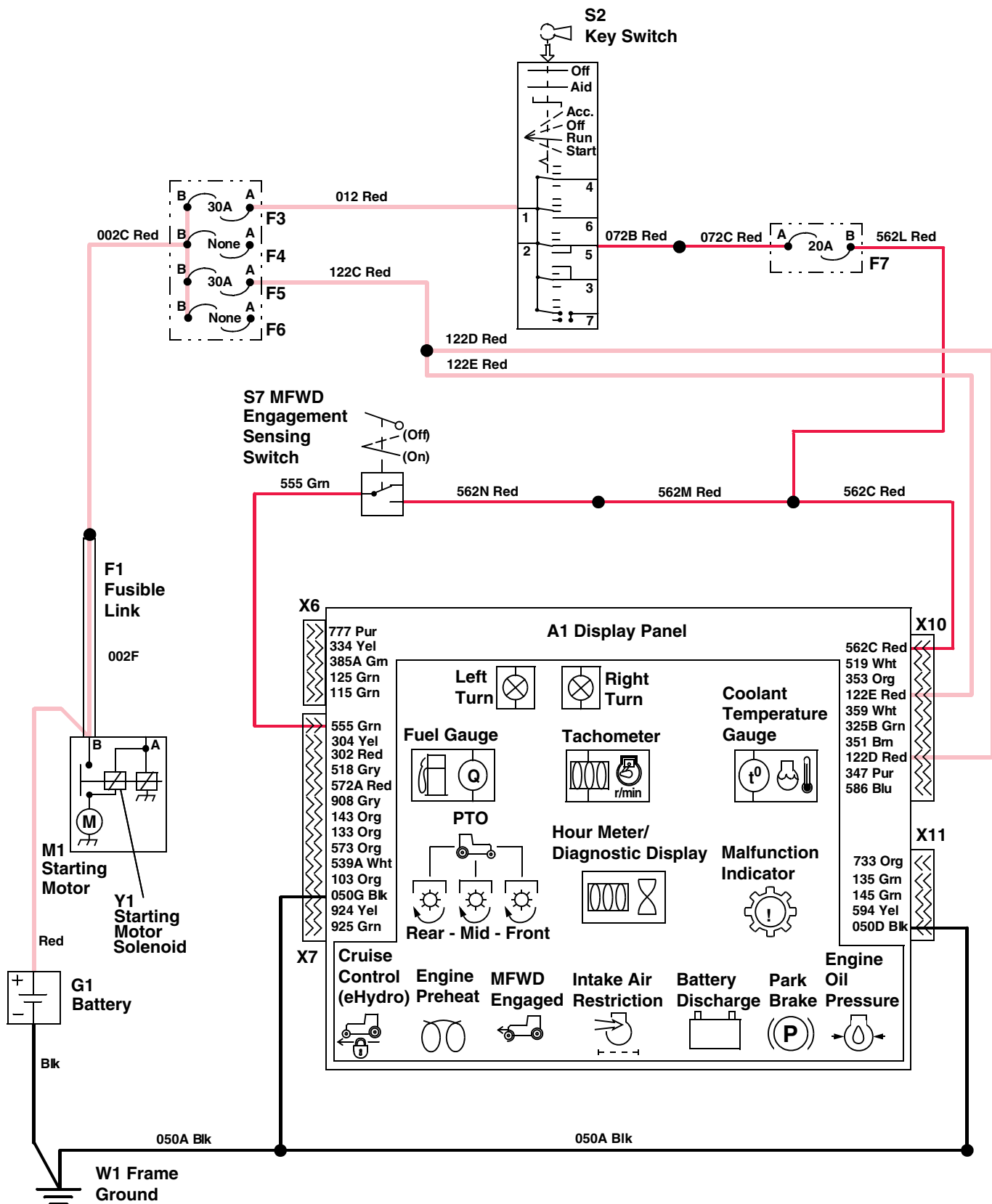
switch through the S2 key switch, 072 Red wires, F7 fuse and 562 Red wires to the MFWD engagement sensing switch.

When the MFWD lever is pulled up to the engaged position, the ball of the switch is pushed in to close the contacts inside the switch. With the switch contacts closed, current flows across the MFWD engagement sensing switch to the 555A Grn wire and X7 connector (terminal A) to the A1 display panel to illuminate the MFWD indicator light.

A ground circuit path for the display panel is provided though the X7 connector (terminal P) 050E Blk wire and X11 connector (terminal H) 050D Blk wire, both spliced into the 050A Blk wire.

AK82585,271AF2C -19-11JAN13-1/1

MFWD Circuit Electrical Schematic—Pre MY08



LVAL12000—UN—17NOV10

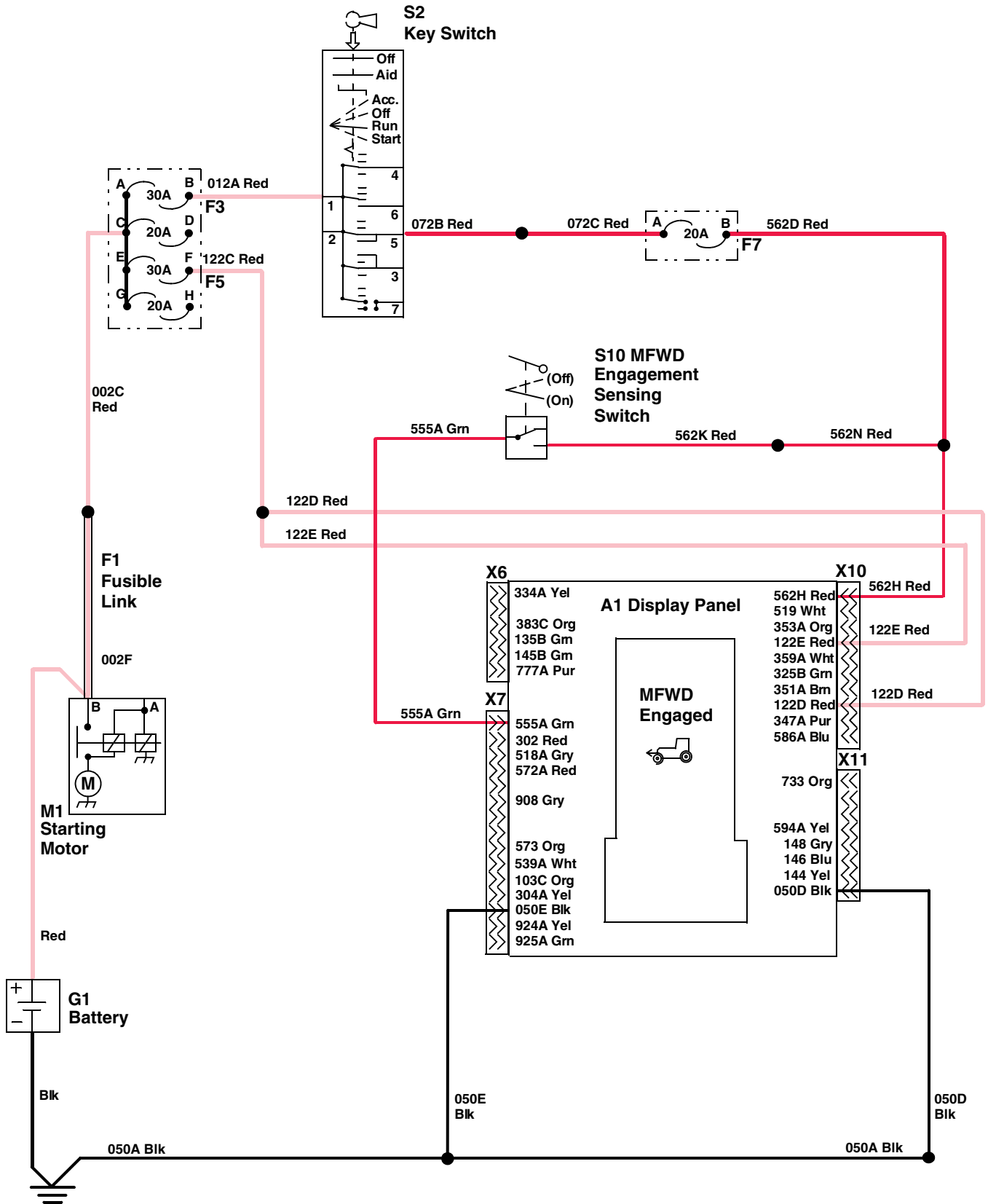
Continued on next page

KN52281,1004398 -19-30OCT12-1/2

A1—Display Panel	M1—Starting Motor	X7—W1 Main Wiring Harness to	Y1—Starting Motor Solenoid
F1—Fusible Link	S2—Key Switch	A1 Display Panel	
F3—Fuse 30A	S7—MFWD Engagement Sensing	X10—W1 Main Wiring Harness	
F4—None	Switch	to A1 Display Panel	
F5—Fuse 30A	W1—Frame Ground	X11—W1 Main Wiring Harness	
F6—None	X6—W1 Main Wiring Harness to	to A1 Display Panel	
F7—Fuse 20A	A1 Display Panel		
G1—Battery			

KN52281,1004398 -19-30OCT12-2/2

MFWD Circuit Electrical Schematic—MY08



LVAL12001—UN—17NOV10

Continued on next page

KN52281,1004399 -19-23OCT12-1/2

A1—Display Panel
F1— Fusible Link
F3— Fuse 30A
F5— Fuse 30A
F7— Fuse 20A
G1—Battery

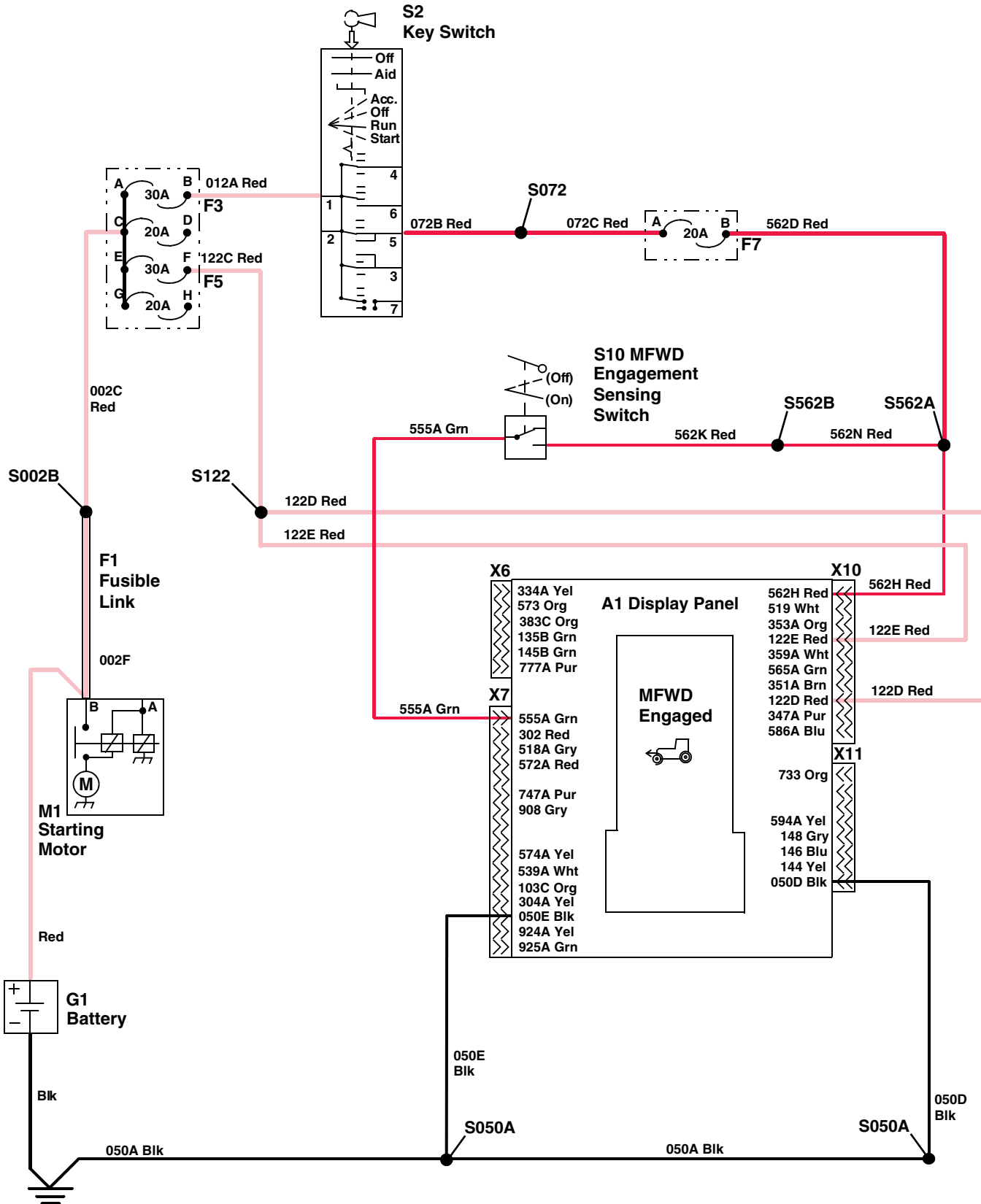
M1—Starting Motor
S2— Key Switch
S10— MFWD Engagement
Sensing Switch
X6— W1 Main Wiring Harness to
A1 Display Panel

X7— W1 Main Wiring Harness to
A1 Display Panel
X10— W1 Main Wiring Harness
to A1 Display Panel

X11— W1 Main Wiring Harness
to A1 Display Panel

KN52281,1004399 -19-23OCT12-2/2

MFWD Circuit Electrical Schematic—MY13



LVAL38890 —UN—26NOV12

Continued on next page

KN52281,10043CE -19-10DEC12-1/2

A1—Display Panel
F1—Fusible Link
F3—Fuse 30A
F5—Fuse 30A
F7—Fuse 20A
G1—Battery

M1—Starting Motor
S2—Key Switch
S10—MFWD Engagement Sensing Switch
X6—W1 Main Wiring Harness to A1 Display Panel

X7—W1 Main Wiring Harness to A1 Display Panel
X10—W1 Main Wiring Harness to A1 Display Panel

X11—W1 Main Wiring Harness to A1 Display Panel

KN52281,10043CE -19-10DEC12-2/2

MFWD Circuit Diagnosis

Test Procedure A

Test Conditions:

- Park brake locked.
- Key switch in the run position, engine off.
- MFWD engaged.

KN52281,100439A -19-23OCT12-1/4

MFWD Indicator Circuit

KN52281,100439A -19-23OCT12-2/4

Step 1

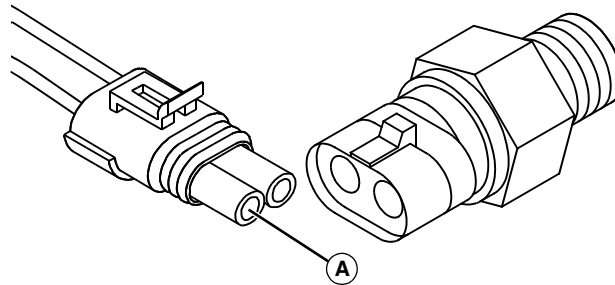
Is MFWD indicator light illuminated?

YES: Circuit is functional. If MFWD is not engaged, see Final Drive Section.

NO: Test MFWD engagement sensing switch. (See [Sensing Switch Test](#) in Section 40, Group 40.) Check 555 Grn wire and connections. If ok, and light does not illuminate, replace display panel.

KN52281,100439A -19-23OCT12-3/4

Step 2



LVAL12002 —UN—17NOV10

A—S7 MFWD Engagement Sensing Switch, 562 Red Wire

Is battery voltage present at the S7 MFWD engagement sensing switch, 562 Red wire (A)?

YES: Test complete.

NO: Test switched power circuit. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

KN52281,100439A -19-23OCT12-4/4

MFWD Circuit Diagnosis—MY13

Test Procedure A

Test Conditions

- Park brake locked.
- Key switch in the run position, engine off.
- MFWD engaged.

Continued on next page

AK82585,271AF2D -19-21JAN13-1/4

MFWD Indicator Circuit

AK82585,271AF2D -19-21JAN13-2/4

Step 1

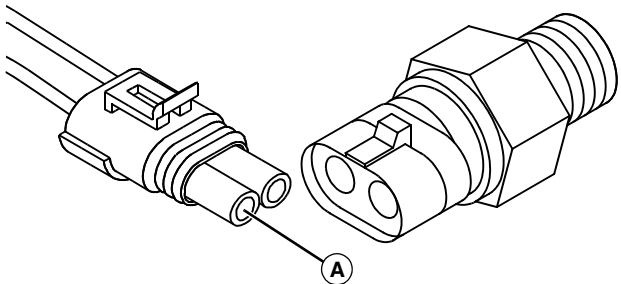
Is MFWD indicator light illuminated?

YES: Circuit is functional. If MFWD is not engaged, see Final Drive Section.

NO: Test MFWD engagement sensing switch. (See [Sensing Switch Test](#).) Check 555A Grn wire and connections. If ok, and light does not illuminate, replace display panel.

AK82585,271AF2D -19-21JAN13-3/4

Step 2



LVAL12002 —UN—17NOV10

A—S10 MFWD Engagement Sensing Switch, 562K Red Wire

Is battery voltage present at the S10 MFWD engagement sensing switch, 562K Red wire (A)?

YES: Test complete.

NO: Test switched power circuit. (See [Power Circuit Diagnosis](#).)

AK82585,271AF2D -19-21JAN13-4/4

Light Circuit Operation—Pre MY08

Model Year 2007 Serial Number Breaks

Model	Transmission	Serial Number
3320	eHydro™	-435000
3320	PRT	-440000
3520	eHydro™	-470000
3520	PRT	-475000

Function:

Provides current to the headlights, tail lights, hazard lights, and work lights in combinations depending upon the position the light switch is placed in.

Operating Conditions:

- Light switch in either marker, hazard, road, or field position.

Theory of Operation:

Power for the light switch is unswitched and provided through the F5 fuse, 122C and 122B Red wires.

Light Switch Marker Position:

In the marker position, voltage is provided from the light switch (terminal 2) through the 103C and 103A Org wires to the F10 fuse, and the 118A Gry wire. The 118A Gry wire splices to the 118B, 118C, 118D, and 118E Gry wires. These wires connect and supply voltage to the right rear marker light, left front marker light, trailer connector, and the license plate light respectively.

At the same time, voltage is provided from the light switch (terminal 2) through the 103C and 103D Org wires to the F12 fuse, and the 128A Gry wire. The 128A Gry wire splices to the 128B, 128C, and 128D Gry wires. These wires connect and supply voltage to the trailer connector, left rear marker light, and right front marker light respectively.

Additionally, voltage is provided from the light switch (terminal 2) through the 103C and 103A Org wires to the

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display panel. This input wakes up the display panel and illuminates the display panel lighting.

The ground path for the right marker lights is provided by 010M and 010L Blk wires and the left marker lights is provided by 010G and 010R Blk wires. The license plate light is grounded on the 010W and 010P Blk wires.

Light Switch Road Position:

In the road position, voltage is provided from the light switch (terminal 2) through the same circuits as when the light switch is in the marker position. This circuit causes the marker lights to illuminate.

In addition, voltage is provided from the light switch (terminal 3) through the 138 Gry wire to the F9 fuse. The F9 fuse provides voltage to the headlights through the 119 Wht wire to the X3 connector, and the 119A Wht wire of the headlight wiring harness. The 119A Wht wire splices to the 119B and 119C Wht wires. The 119B Wht wire connects to the left headlight, and the 119C Wht wire connects to the right headlight.

The ground path for the headlights is provided by 010A, 010B, and 010P Blk wires.

Light Switch Field Position:

In the field position, voltage is removed from the marker lights circuit, however, voltage remains to the headlights, and is provided to the work lights (terminal 4).

Voltage is provided from the light switch (terminal 4), through the 137 Pur wire to the F8 fuse. The F8 fuse provides voltage to the work lights through the 147A Pur wire. The 147A Pur wire splices to the 147B and 147C Pur wires to the work lights. The 147B Pur wire connects to the left work light, and the 147C Pur wire connects to the right work light.

The ground path for the work lights is provided by 010 Blk series of wires.

KN52281,100439B -19-30OCT12-1/1

Light Circuit Operation—MY08

Model Year 2008 Serial Number Breaks

Model	Transmission	Serial Number
3320	eHydro™	435001-
3320	PRT	440001-
3520	eHydro™	470001-
3520	PRT	475001-
3720	eHydro™	492001-

Function:

Provides current to the headlights, tail lights, hazard lights, and work lights in combinations depending upon the position the light switch is placed in.

Operating Conditions:

- Light switch in either marker, hazard, road, or field position.

Theory of Operation:

Power for the light switch is unswitched and provided through the F5 fuse, 122C and 122B Red wires.

Light Switch Marker Position:

In the marker position, voltage is provided from the light switch (terminal 2) through the 103A and 103C Org wires to the K4 lights relay (terminal 87), and 133A Org wire to the load center fuse F10. The load center has a buss connection between fuses 9 and 10. From the F10 fuse the 118B Gry wire splices to the 118C, 118D, 118E, and 118F Gry wires. These wires connect and supply voltage to the left front marker light, right rear marker light, trailer connector, and the license plate light respectively.

At the same time, voltage is provided from the F9 fuse to the 128B Gry wire. The 128B Gry wire splices to the 128C, 128D, and 128E Gry wires. These wires connect and supply voltage to the trailer connector, left rear marker light, and right front marker light respectively.

Additionally, voltage is provided from the light switch (terminal 2) through the 103A and 103C Org wires to the display panel. This input wakes up the display panel and illuminates the display panel lighting.

The ground path for the right marker lights is provided by 010D, 010AN and 010C Blk wires and the left marker

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lights is provided by 010G, 010AM and 010C Blk wires. The license plate light is grounded on the 010R and 010AR Blk wires.

Light Switch Road Position:

In the road position, voltage is provided from the light switch (terminal 2) through the same circuits as when the light switch is in the marker position. This circuit causes the marker lights to illuminate.

In addition, voltage is provided from the light switch (terminal 3) through the 13A Gry wire to the F12 fuse. The F12 fuse provides voltage to the headlights through the 119A Wht wire to the X3 connector, and the 119 Wht wire of the headlight wiring harness. The 119 Wht wire splices to the 119B and 119C Wht wires. The 119B Wht wire connects to the left headlight, and the 119C Wht wire connects to the right headlight.

The ground path for the headlights is provided by 010A and 010P Blk wires.

Light Switch Field Position:

In the field position, voltage is maintained to the marker lights circuit, however, the K4 lights relay is energized and the marker lights receive power without going through the light switch. Voltage remains to the headlights, and is also provided to the work lights (terminal 4).

Voltage is provided from the light switch (terminal 4), through the 137A Pur wire to the F8 fuse. The F8 fuse provides voltage to the work lights through the 147A Pur wire. The 147A Pur wire splices to the 147B and 147C Pur wires to the work lights. The 147B Pur wire connects to the left work light, and the 147C Pur wire connects to the right work light.

A second wire, 137C Pur, is tied to the 137A Pur wire at the F8 fuse. The 137C wire provides power to the coil of the K4 lights relay. When the K4 lights relay coil is energized the contacts close and power is supplied to the F9 and F10 fuses through the contacts from the 122H Red unswitched power wire and not through the S3 light switch.

The ground path for the work lights and the K4 lights relay is provided by two separate 010 Blk series of wires.

KN52281,100439C -19-23OCT12-1/1

Light Circuit Operation—MY13

Function

Provides current to the headlights, tail lights, hazard lights, and work lights in combinations depending upon the position the light switch is placed in.

Operating Conditions

- Light switch in either marker, hazard, road, or field position.

Theory of Operation

Power for the light switch is unswitched and provided through the F5 fuse, 122C and 122B Red wires.

Light Switch Marker Position

In the marker position, voltage is provided from the light switch (terminal 2) through the 103A and 103B Org wires to the K4 lights relay (terminal 87A), and 133A Org wire to the load center fuse F10. The load center has a buss connection between fuses 9 and 10. From the F10 fuse the 118B Gry wire splices to the 118C, 118D, 118E, and 118F Gry wires. These wires connect and supply voltage to the left front marker light, right rear marker light, trailer connector, and the license plate light respectively.

At the same time, voltage is provided from the F9 fuse to the 128B Gry wire. The 128B Gry wire splices to the 128C, 128D, and 128E Gry wires. These wires connect and supply voltage to the trailer connector, left rear marker light, and right front marker light respectively.

Additionally, voltage is provided from the light switch (terminal 2) through the 103A and 103C Org wires to the display panel. This input wakes up the display panel and illuminates the display panel lighting.

The ground path for the right marker lights is provided by 010D, 010AN and 010C Blk wires and the left marker lights is provided by 010G, 010AM and 010C Blk wires. The license plate light is grounded on the 010R and 010AR Blk wires.

Light Switch Road Position

In the road position, voltage is provided from the light switch (terminal 2) through the same circuits as when the light switch is in the marker position. This circuit causes the marker lights to illuminate.

In addition, voltage is provided from the light switch (terminal 3) through the 138A Gry wire to the F12 fuse. The F12 fuse provides voltage to the headlights through the 119A Wht wire to the X3 connector, and the 119 Wht wire of the headlight wiring harness. The 119 Wht wire splices to the 119B and 119C Wht wires. The 119B Wht wire connects to the left headlight, and the 119C Wht wire connects to the right headlight.

The ground path for the headlights is provided by 010A and 010P Blk wires.

Light Switch Field Position

In the field position, voltage is maintained to the marker lights circuit, however, the K4 lights relay is energized and the marker lights receive power without going through the light switch. Voltage remains to the headlights, and is also provided to the work lights (terminal 4).

Voltage is provided from the light switch (terminal 4), through the 137A Pur wire to the F8 fuse. The F8 fuse provides voltage to the work lights through the 147A Pur wire. The 147A Pur wire splices to the 147B and 147C Pur wires to the work lights. The 147B Pur wire connects to the right work light, and the 147C Pur wire connects to the left work light.

A second wire, 137C Pur, is tied to the 137A Pur wire at the F8 fuse. The 137C wire provides power to the coil of the K4 lights relay. When the K4 lights relay coil is energized the contacts close and power is supplied to the F9 and F10 fuses through the contacts from the 122H Red unswitched power wire and not through the S3 light switch.

The ground path for the work lights and the K4 lights relay is provided by two separate 010 Blk series of wires.

KN52281,10043CF -19-11JAN13-1/1

Brake Lights Circuit Operation

Function (All Models):

Provide power to the brake lights when the brake pedal is depressed.

Operating Conditions:

The brake pedal must be depressed.

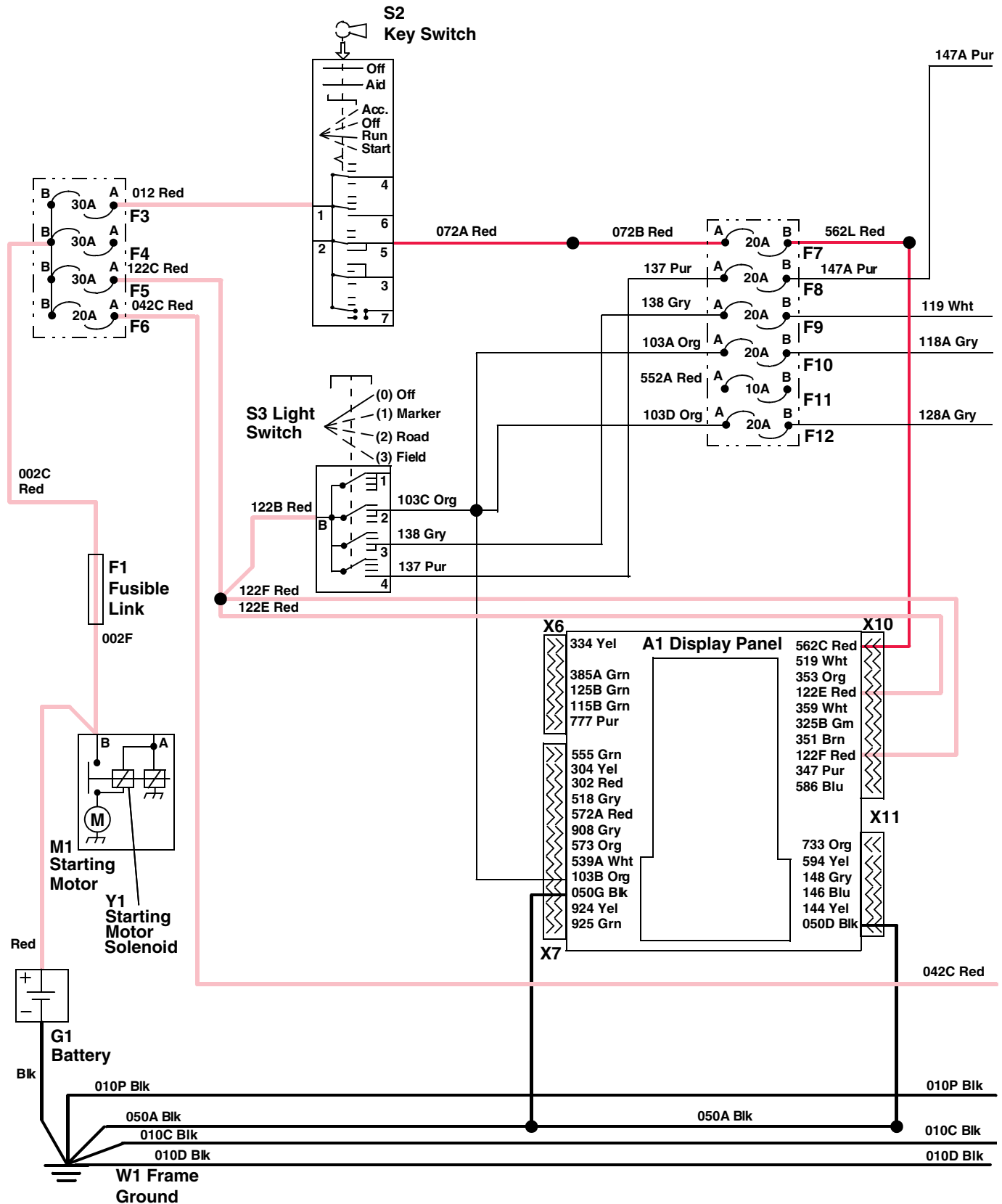
Theory of Operation:

Unswitched power is provided to the brake switch and the brake light relay (terminal 30) through the F6 fuse, 042C, 042A, and 042D Red wires.

When the brake pedal is pressed, the brake switch closes. The closed brake switch contacts provide power to the brake light relay coil (terminal 86). When the brake light relay coil is energized, the relay contacts close. The closed contacts provide a current path to the right brake light through the 136A and 136D Blu wires, the left brake light through the 136A and 136C Blue wires; and, the trailer connector (terminal 6) through the 136A and 136B Blue wires.

KN52281,100439D -19-23OCT12-1/1

Lights Circuit Electrical Schematic—Pre MY08



LVAL12003 —UN—17NOV10

Continued on next page

KN52281.100439E -19-01NOV12-1/4

A1—Display Panel
F1—Fusible Link
F3—Fuse 30A
F4—Fuse 30A
F5—Fuse 30A
F6—Fuse 20A
F7—Fuse 20A
F8—Fuse 20A
F9—Fuse 20A

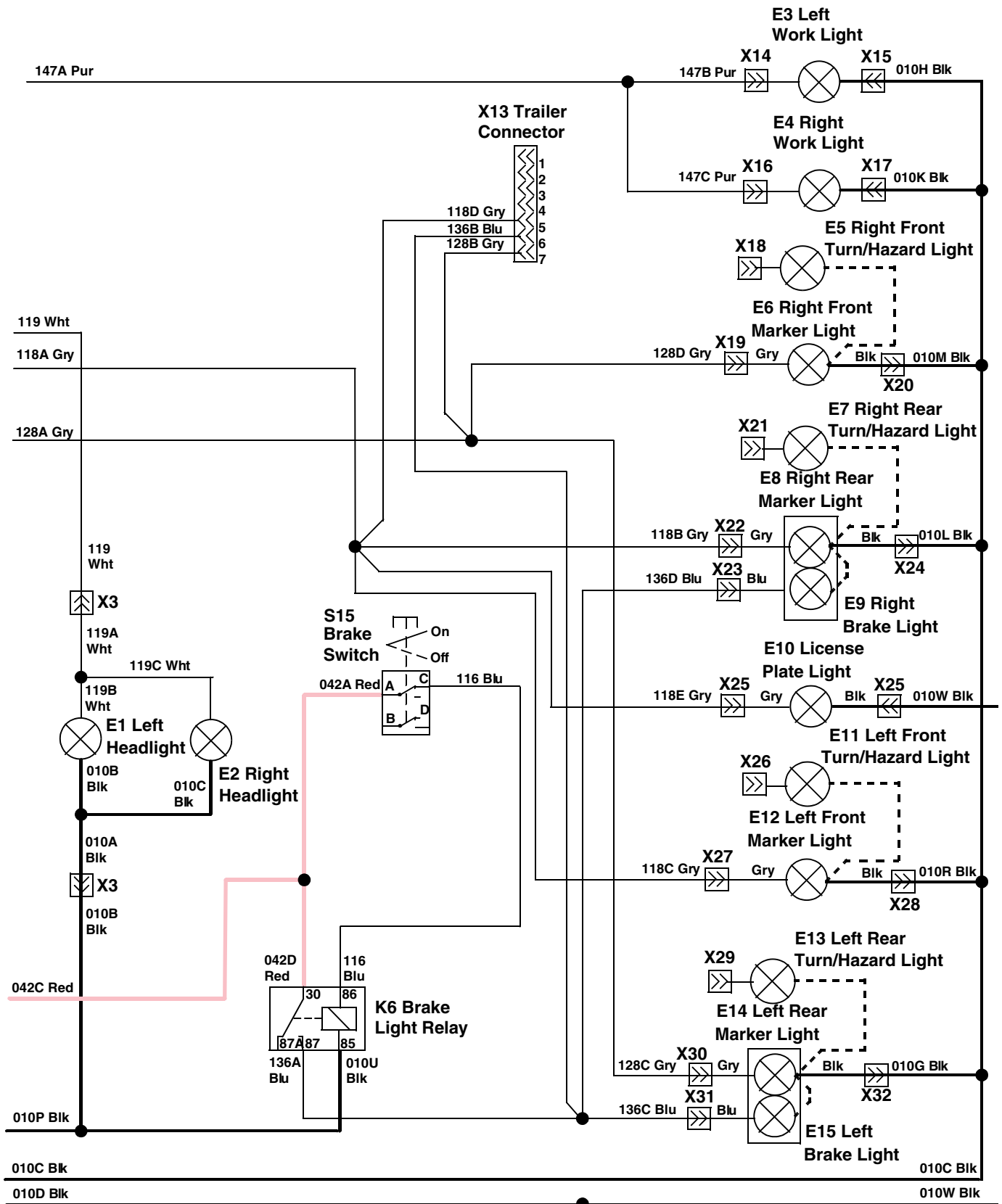
F10— Fuse 20A
F11— Fuse 10A
F12— Fuse 20A
G1—Battery
M1—Starting Motor
S2—Key Switch
S3—Light Switch
W1—Frame Ground

X6—W1 Main Wiring Harness to
A1 Display Panel
X7—W1 Main Wiring Harness to
A1 Display Panel
X10— W1 Main Wiring Harness
to A1 Display Panel

X11— W1 Main Wiring Harness
to A1 Display Panel
Y1—Starting Motor Solenoid

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KN52281,100439E -19-01NOV12-2/4



LVAL12004—UN—17NOV10

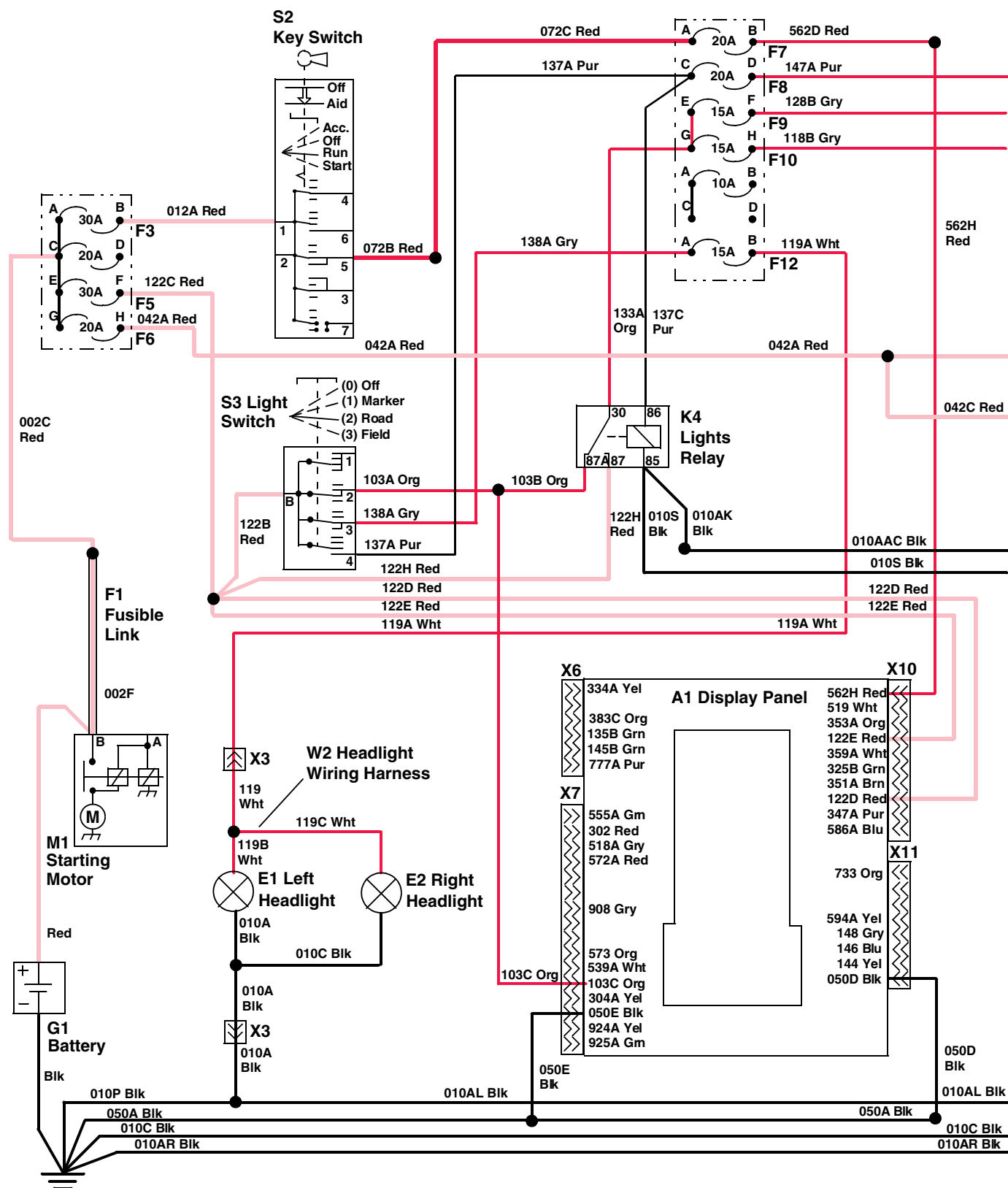
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KN52281,100439E -19-01NOV12-3/4

E1— Left Headlight	X13— W1 Main Wiring Harness Trailer Connector	X20— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X28— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E2— Right Headlight	X14— W1 Main Wiring Harness to W5 Left Work Light Wiring Harness (optional)	X21— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X29— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E3— Left Work Light	X15— W1 Main Wiring Harness to W5 Left Work Light Wiring Harness (optional)	X22— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X30— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E4— Right Work Light	X16— W1 Main Wiring Harness to W6 Right Work Light Wiring Harness (optional)	X23— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X31— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E5— Right Front Turn/Hazard Light	X17— W1 Main Wiring Harness to W6 Right Work Light Wiring Harness (optional)	X24— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X32— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E6— Right Front Marker Light	X18— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X25— W1 Main Wiring Harness to E10 License Plate Light	
E7— Right Rear Turn/Hazard Light	X19— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X26— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
E8— Right Rear Marker Light		X27— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
E9— Right Brake Light			
E10— License Plate Light			
E11— Left Front Turn/Hazard Light			
E12— Left Front Marker Light			
E13— Left Rear Turn/Hazard Light			
E14— Left Rear Marker Light			
E15— Left Brake Light			
K6— Brake Light Relay			
S15— Brake Switch			
X3— W1 Main Wiring Harness to W2 Headlight/Horn Wiring Harness			

KN52281,100439E -19-01NOV12-4/4

Lights Circuit Electrical Schematic—MY08



LVAL12005—UN—17NOV10

Continued on next page

KN52281,100439F -19-23OCT12-1/4

A1—Display Panel
E1—Left Headlight
E2—Right Headlight
F1—Fusible Link
F3—Fuse 30A
F5—Fuse 30A
F6—Fuse 20A
F7—Fuse 20A
F8—Fuse 20A

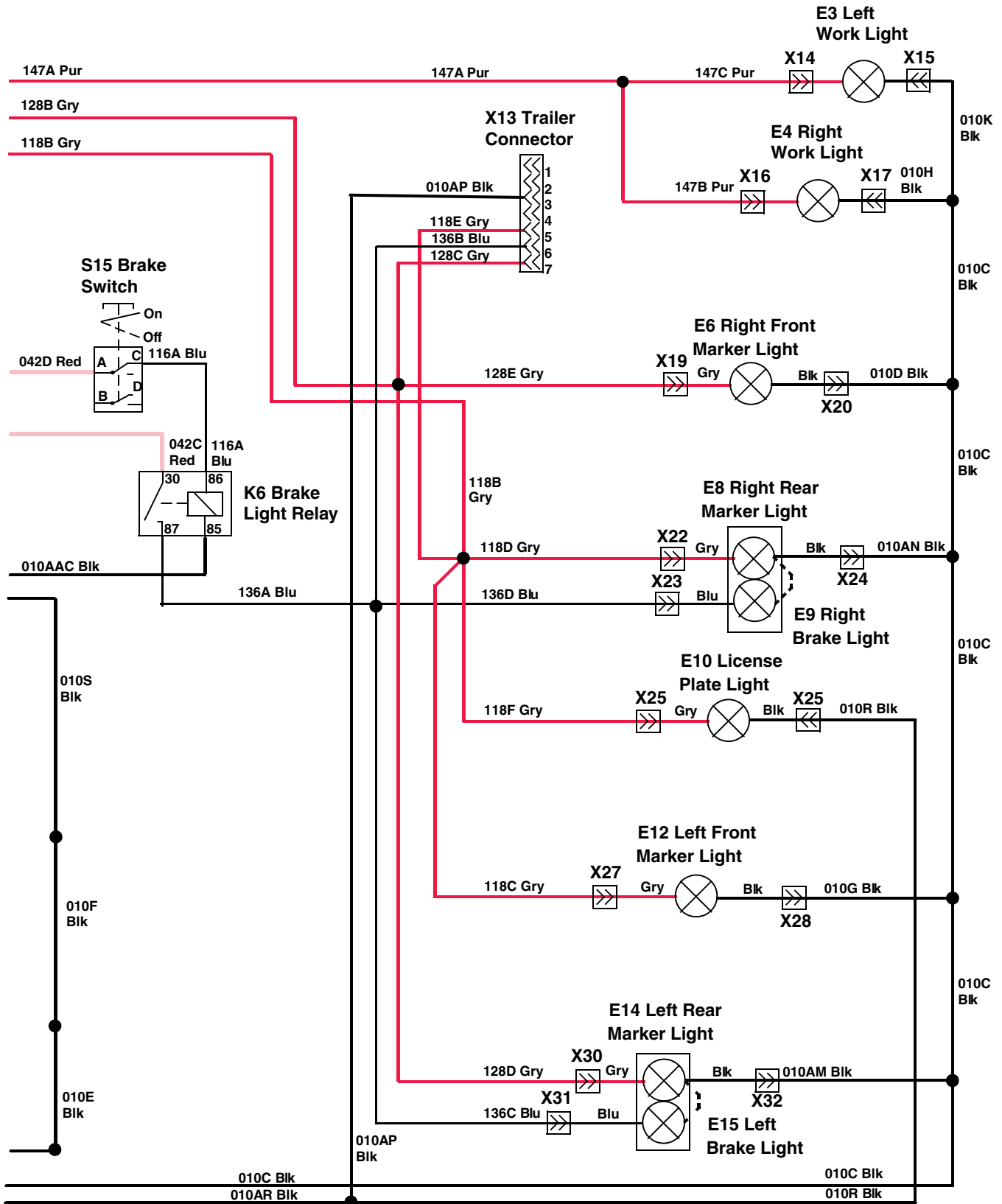
F9—Fuse 15A
F10—Fuse 15A
F12—Fuse 15A
G1—Battery
K4—Lights Relay
M1—Starting Motor
S2—Key Switch
S3—Light Switch
W2—Headlight/Horn Wiring
Harness

X3—W1 Main Wiring Harness to
W2 Headlight/Horn Wiring
Harness
X6—W1 Main Wiring Harness to
A1 Display Panel
X7—W1 Main Wiring Harness to
A1 Display Panel

X10—W1 Main Wiring Harness
to A1 Display Panel
X11—W1 Main Wiring Harness
to A1 Display Panel

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KN52281,100439F -19-23OCT12-2/4



LVAL12006—UN—17NOV10

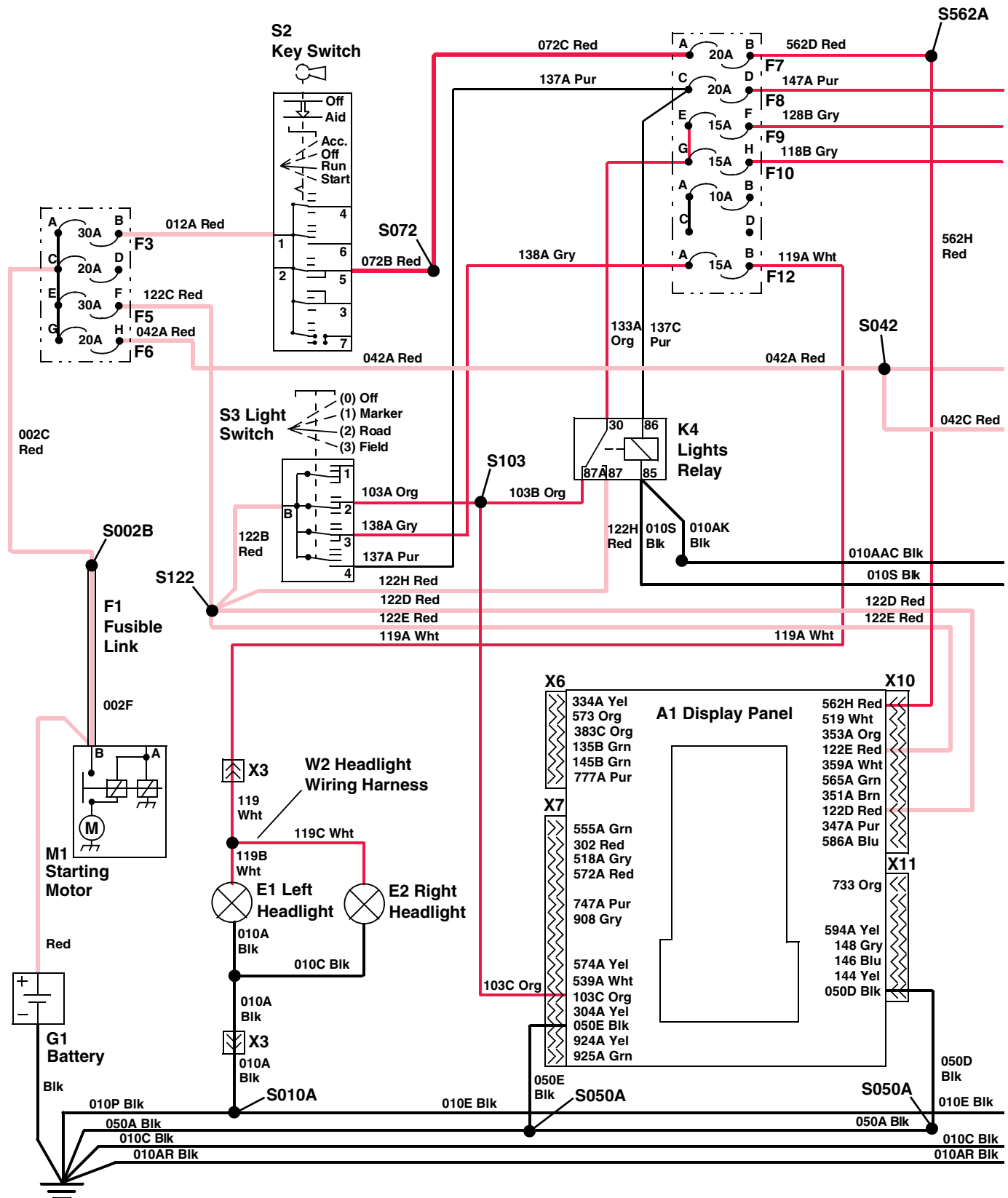
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KN52281,100439F -19-23OCT12-3/4

E3— Left Work Light	X15— W1 Main Wiring Harness to W5 Left Work Light Wiring Harness (optional)	X22— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X30— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E4— Right Work Light			
E6— Right Front Marker Light			
E8— Right Rear Marker Light	X16— W1 Main Wiring Harness to W6 Right Work Light Wiring Harness (optional)	X23— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X31— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E9— Right Brake Light			
E10— License Plate Light			
E12— Left Front Marker Light	X17— W1 Main Wiring Harness to W6 Right Work Light Wiring Harness (optional)	X24— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X32— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E14— Left Rear Marker Light			
E15— Left Brake Light			
K6— Brake Light Relay	X19— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X25— W1 Main Wiring Harness to E10 License Plate Light	
S15— Brake Switch			
X13— W1 Main Wiring Harness Trailer Connector	X20— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X27— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
X14— W1 Main Wiring Harness to W5 Left Work Light Wiring Harness (optional)		X28— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	

KN52281,100439F -19-23OCT12-4/4

Lights Circuit Electrical Schematic—MY13



LVAL38891 —UN—26NOV12

Continued on next page

KN52281,10043D0 -19-10JAN13-1/4

A1—Display Panel
E1—Left Headlight
E2—Right Headlight
F1—Fusible Link
F3—Fuse 30A
F5—Fuse 30A
F6—Fuse 20A
F7—Fuse 20A
F8—Fuse 20A

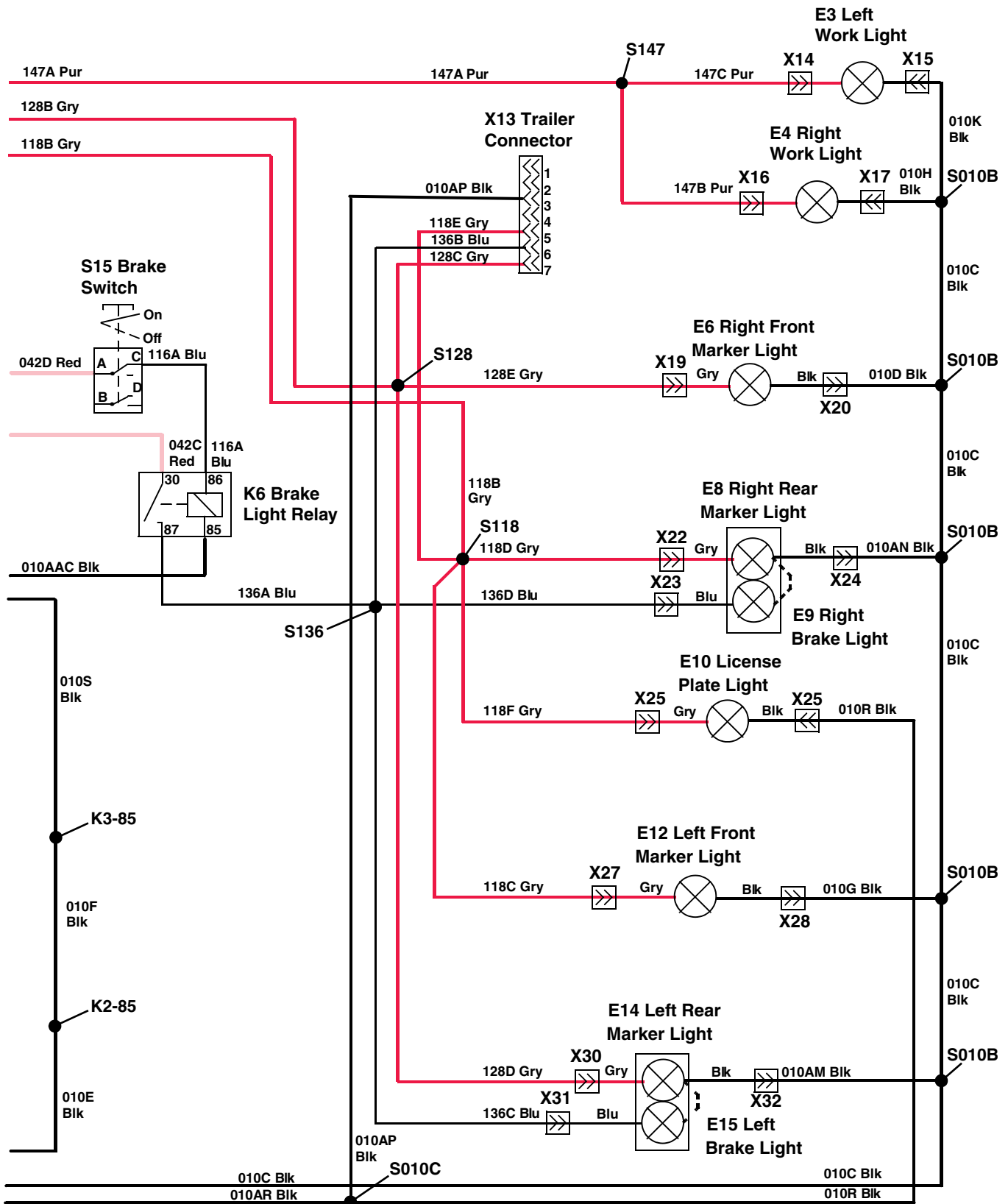
F9—Fuse 15A
F10—Fuse 15A
F12—Fuse 15A
G1—Battery
K4—Lights Relay
M1—Starting Motor
S2—Key Switch
S3—Light Switch
W2—Headlight Wiring Harness

X3—W1 Main Wiring Harness to
W2 Headlight/Horn Wiring
Harness
X6—W1 Main Wiring Harness to
A1 Display Panel
X7—W1 Main Wiring Harness to
A1 Display Panel

X10—W1 Main Wiring Harness
to A1 Display Panel
X11—W1 Main Wiring Harness
to A1 Display Panel

Continued on next page

KN52281,10043D0 -19-10JAN13-2/4



LVAL38892—UN—26NOV12

Continued on next page

KN52281,10043D0 -19-10JAN13-3/4

E3— Left Work Light	X15— W1 Main Wiring Harness to W5 Left Work Light Wiring Harness (optional)	X22— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X30— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E4— Right Work Light	X16— W1 Main Wiring Harness to W6 Right Work Light Wiring Harness (optional)	X23— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X31— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E6— Right Front Marker Light	X17— W1 Main Wiring Harness to W6 Right Work Light Wiring Harness (optional)	X24— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X32— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E8— Right Rear Marker Light	X19— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X25— W1 Main Wiring Harness to E10 License Plate Light	
E9— Right Brake Light	X20— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X27— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
E10— License Plate Light		X28— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
E12— Left Front Marker Light			
E14— Left Rear Marker Light			
E15— Left Brake Light			
K6— Brake Light Relay			
S15— Brake Switch			
X13— W1 Main Wiring Harness Trailer Connector			
X14— W1 Main Wiring Harness to W5 Left Work Light Wiring Harness (optional)			

KN52281,10043D0 -19-10JAN13-4/4

Lights Circuit Diagnosis—Pre MY08

Model Year 2007 Serial Number Breaks

Model	Transmission	Serial Number
3320	eHydro™	-435000
3320	PRT	-440000
3520	eHydro™	-470000
3520	PRT	-475000

Test Procedure A

NOTE: Test the bulb in each light circuit before beginning the diagnosis steps for the specific circuit.

eHydro is a trademark of Deere & Company

Test Conditions:

- Park brake locked.
- Key switch in off position.
- Light switch in marker position.
- Check circuit grounds for continuity as tests are performed.

KN52281,10043A0 -19-30OCT12-1/23

Marker Lights Circuit

KN52281,10043A0 -19-30OCT12-2/23

Step 1

Is left rear red light illuminated?

YES: Left rear marker light circuit is functional.

NO: Test the F12 fuse. Check the 128C and 128A Gry wires and connections. Go to next step.

KN52281,10043A0 -19-30OCT12-3/23

Step 2

Is right front clear light illuminated?

YES: Right front marker light circuit is functional.

NO: Test the F12 fuse. Check the 128D and 128A Gry wires and connections. Go to next step.

Continued on next page

KN52281,10043A0 -19-30OCT12-4/23

Step 3

Is right rear red light illuminated?

YES: Right rear marker light circuit is functional.
NO: Test the F10 fuse. Check the 118B and 118A Gry wires and connections. Go to next step.

KN52281,10043A0 -19-30OCT12-5/23

Step 4

Is left front clear light illuminated?

YES: Left front marker light circuit is functional.
NO: Test the F10 fuse. Check the 118C and 118A Gry wires and connections. Go to next step.

KN52281,10043A0 -19-30OCT12-6/23

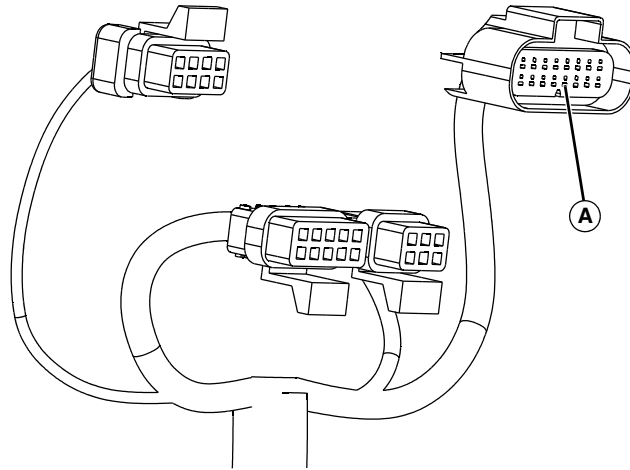
Step 5

Is license plate light illuminated?

YES: License plate light circuit is functional.
NO: Test the F10 fuse. Check the 118E and 118A Gry wires and connections. Go to next step.

KN52281,10043A0 -19-30OCT12-7/23

Step 6



LVAL12007 —UN—17NOV10

A—X7 Connector Terminal M, 103B Org Wire

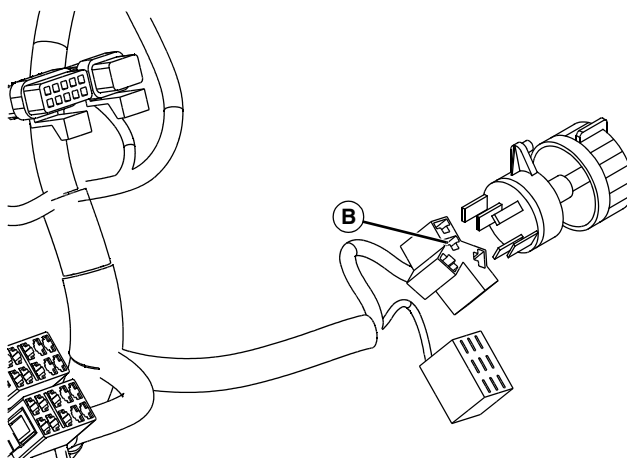
Disconnect X7 connector to the display panel. Is battery voltage present at terminal M, 103B Org wire (A)?

YES: Connect X7 connector. If display panel does not illuminate, replace display panel.
NO: Check 103C and 103B Org wires and connections. Test light switch.

Continued on next page

KN52281,10043A0 -19-30OCT12-8/23

Step 7



LVAL12008 —UN—17NOV10

B—S3 Light Switch Connector, 122B Red Wire

Disconnect the light switch. Is battery voltage present at S3 light switch connector 122B Red wire (B)?

YES: Circuit is functional.

NO: Test unswitched power circuit. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

KN52281,10043A0 -19-30OCT12-9/23

Test Procedure B

Test Conditions:

- Park brake locked.

- Key switch in off position.
- Light switch in road position.

KN52281,10043A0 -19-30OCT12-10/23

Road Lights Circuit

KN52281,10043A0 -19-30OCT12-11/23

Step 1

Are the marker lights illuminated?

YES: Marker lights are functional. Go to next step.
NO: See "Marker Lights Circuit" above.

KN52281,10043A0 -19-30OCT12-12/23

Step 2

Is right headlight illuminated?

YES: Right headlight circuit is functional.
NO: Test bulb. Go to next step.

KN52281,10043A0 -19-30OCT12-13/23

Step 3

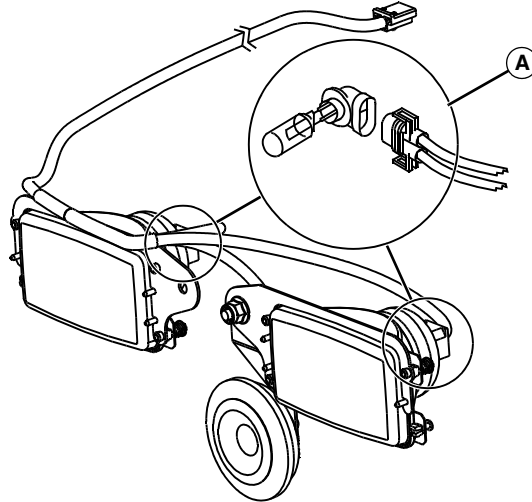
Is left headlight illuminated?

YES: Left headlight circuit is functional.
NO: Test bulb. Go to next step.

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KN52281,10043A0 -19-30OCT12-14/23

Step 4



LVAL12009 —UN—17NOV10

A—Headlight Light Bulb and Connector

Disconnect each light bulb connector. Is battery voltage present at the 119B and 119C Wht wires at the headlights (A)?

YES: Go to next step.

NO: Test F9 fuse. Test light switch. Check 138 Gry wire, 119 Wht, X3 connector, 119A, 119B, and 119C Wht wires and connections.

KN52281,10043A0 -19-30OCT12-15/23

Step 5

Is continuity to ground present at the 010B and 010C Blk wires at the headlights (A)?

YES: Connect each light bulb connector. Go to next step.

NO: Check 010P, 010B Blk wires, X3 connector, 010A, 010B, and 010C Blk wires and connections.

KN52281,10043A0 -19-30OCT12-16/23

Test Procedure C

Test Conditions:

- Park brake locked.
- Key switch in off position.
- Light switch in field position.

KN52281,10043A0 -19-30OCT12-17/23

Field Lights Circuit

KN52281,10043A0 -19-30OCT12-18/23

Step 1

Are the marker lights illuminated?

YES: Check for short to marker lights circuit. Test light switch. See "Marker Lights Circuit" above.

NO: Go to next step.

KN52281,10043A0 -19-30OCT12-19/23

Step 2

Are headlights illuminated?

YES: Headlight circuit is functional.

NO: See "Road Lights Circuit" above.

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KN52281,10043A0 -19-30OCT12-20/23

Step 3

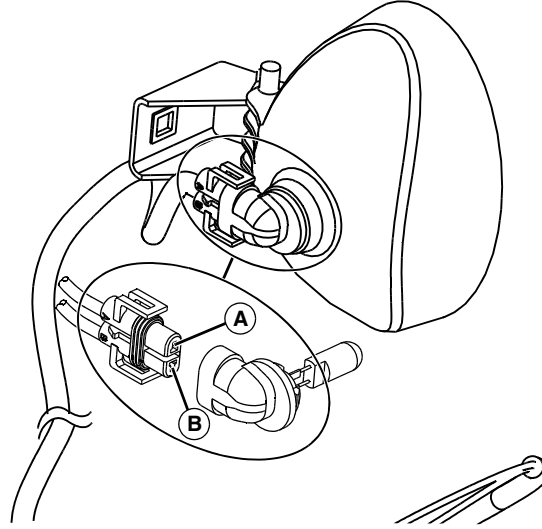
Are all work lights illuminated?

YES: Work lights circuit is functional.

NO: Test bulb for each work light that is not illuminated. Go to next step.

KN52281,10043A0 -19-30OCT12-21/23

Step 4



LVAL12010 —UN—17NOV10

A—Pur Wire
B—Blk Wire

Remove the bulb from the work light to be tested. Is battery voltage present at the Pur wire (A)?

YES: Go to next step.

NO: Test F8 fuse. Test light switch. Check 137 Pur wire, 147A, 147B, and 147C Pur wires and connections.

KN52281,10043A0 -19-30OCT12-22/23

Step 5

Is continuity to ground present at the 010H and 010K Blk wires at the work lights (B)?

YES: Install the work light bulb(s). Go to next step.

NO: Check 010H, 010K, and 010C Blk wires and connections.

KN52281,10043A0 -19-30OCT12-23/23

Lights Circuit Diagnosis—MY08

Model Year 2008 Serial Number Breaks

Model	Transmission	Serial Number
3320	eHydro™	435001-
3320	PRT	440001-
3520	eHydro™	470001-
3520	PRT	475001-
3720	eHydro™	492001-

eHydro is a trademark of Deere & Company

Test Procedure A

NOTE: Test the bulb in each light circuit before beginning the diagnosis steps for the specific circuit.

Test Conditions:

- Park brake locked.
- Key switch in off position.
- Light switch in marker position.
- Check circuit grounds for continuity as tests are performed.

Continued on next page

KN52281,10043A1 -19-23OCT12-1/24

Marker Lights Circuit

KN52281,10043A1 -19-23OCT12-2/24

Step 1

Is left rear red light illuminated?

YES: Left rear marker light circuit is functional.

NO: Test the F9 fuse. Check the 128B and 128D Gry wires and connections. Go to next step.

KN52281,10043A1 -19-23OCT12-3/24

Step 2

Is right front clear light illuminated?

YES: Right front marker light circuit is functional.

NO: Check the 128B and 128E Gry wires and connections. Go to next step.

KN52281,10043A1 -19-23OCT12-4/24

Step 3

Is right rear red light illuminated?

YES: Right rear marker light circuit is functional.

NO: Test the F10 fuse. Check the 118B and 118D Gry wires and connections. Go to next step.

KN52281,10043A1 -19-23OCT12-5/24

Step 4

Is left front clear light illuminated?

YES: Left front marker light circuit is functional.

NO: Check the 118C and 118B Gry wires and connections. Go to next step.

KN52281,10043A1 -19-23OCT12-6/24

Step 5

Is license plate light illuminated?

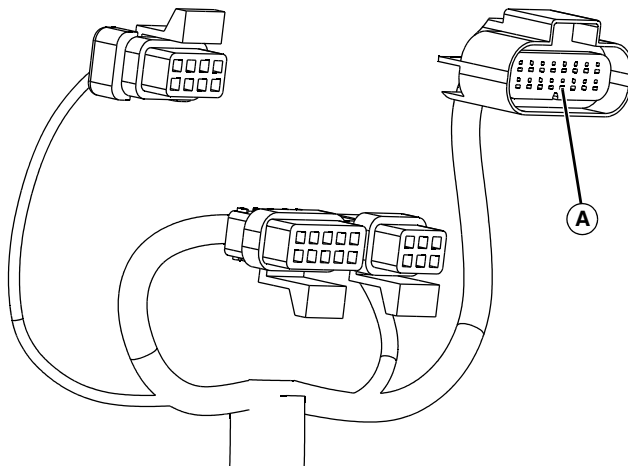
YES: License plate light circuit is functional.

NO: Check the 118F and 118B Gry wires and connections. Go to next step.

KN52281,10043A1 -19-23OCT12-7/24

Continued on next page

Step 6



LVAL12011 —UN—17NOV10

A—X7 Connector Terminal M, 103C Org Wire

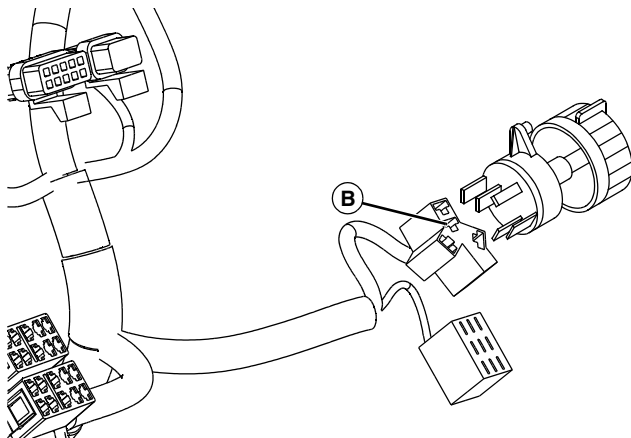
Disconnect X7 connector to the display panel. Is battery voltage present at terminal M, 103C Org wire (A)?

YES: Connect X7 connector. If display panel does not illuminate, check display panel ground circuit. Replace display panel as needed.

NO: Check 103C and 103A Org wires and connections. Test light switch.

KN52281,10043A1 -19-23OCT12-8/24

Step 7



LVAL12012 —UN—17NOV10

B—S3 Light Switch Connector, 122B Red Wire

Disconnect the light switch. Is battery voltage present at S3 light switch connector 122B Red wire (B)?

YES: Circuit is functional.

NO: Test unswitched power circuit. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

KN52281,10043A1 -19-23OCT12-9/24

Test Procedure B

Test Conditions:

- Park brake locked.

- Key switch in off position.
- Light switch in road position.

Continued on next page

KN52281,10043A1 -19-23OCT12-10/24

Road Lights Circuit

KN52281,10043A1 -19-23OCT12-11/24

Step 1

Are the marker lights illuminated?

YES: Marker lights are functional. Go to next step.
NO: See "Marker Lights Circuit" above.

KN52281,10043A1 -19-23OCT12-12/24

Step 2

Is right headlight illuminated?

YES: Right headlight circuit is functional.
NO: Test bulb. Go to next step.

KN52281,10043A1 -19-23OCT12-13/24

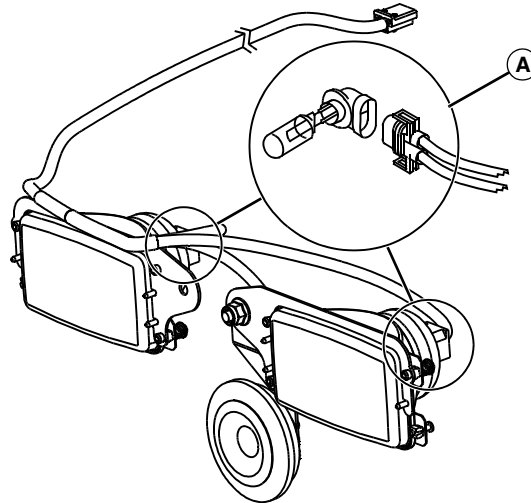
Step 3

Is left headlight illuminated?

YES: Left headlight circuit is functional.
NO: Test bulb. Go to next step.

KN52281,10043A1 -19-23OCT12-14/24

Step 4



LVAL12013 —UN—17NOV10

A—Headlight Light Bulb and Connector

Disconnect each light bulb connector. Is battery voltage present at the 119B and 119C Wht wires at the headlights (A)?

YES: Go to next step.

NO: Test F12 fuse. Test light switch. Check 138A Gry wire, 119A Wht, X3 connector, , and 119 Wht wires and connections.

KN52281,10043A1 -19-23OCT12-15/24

Step 5

Is continuity to ground present at the 010 Blk wires at the headlights (A)?

YES: Connect each light bulb connector. Go to next step.

NO: Check 010 Blk wires, X3 connector, 010A, and 010P Blk wires and connections.

Continued on next page

KN52281,10043A1 -19-23OCT12-16/24

Test Procedure C

Test Conditions:

- Park brake locked.

- Key switch in off position.
- Light switch in field position.

KN52281,10043A1 -19-23OCT12-17/24

Field Lights Circuit

KN52281,10043A1 -19-23OCT12-18/24

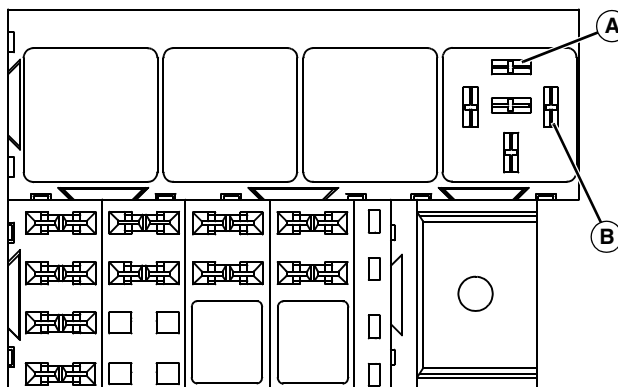
Step 1

Are the marker lights illuminated?

YES: Skip next step.
NO: Go to next step.

KN52281,10043A1 -19-23OCT12-19/24

Step 2



LVAL12014 —UN—17NOV10

A—K4 Relay Socket Terminal 87, 122H Red Wire
B—K4 Relay Socket Terminal 86, 137C Pur Wire

Remove K4 lights relay. Is battery voltage present at K4 relay socket, terminal 87, 122H Red wire (A) and terminal 86, 137C Pur wire (B)?

YES: Test K4 relay.
Replace relay as needed.
Go to next step.

NO: Terminal 87: 122H Red wire and connections.
NO: Terminal 86: Check for power at F8 fuse. Check 137C Pur wire and connections.

KN52281,10043A1 -19-23OCT12-20/24

Step 3

Are headlights illuminated?

YES: Headlight circuit is functional.
NO: See "Road Lights Circuit" above.

KN52281,10043A1 -19-23OCT12-21/24

Step 4

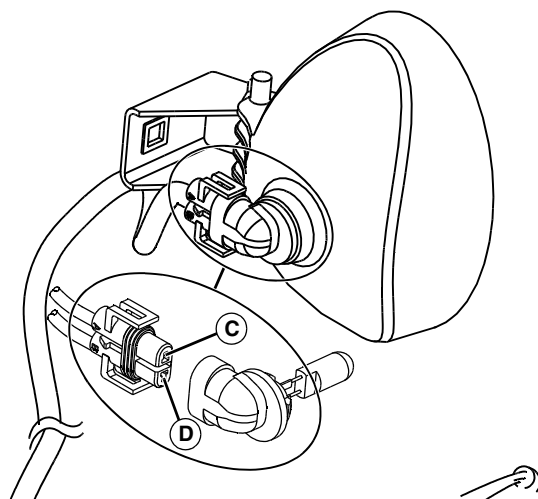
Are all work lights illuminated?

YES: Work lights circuit is functional.
NO: If both lights do not function: Check F8 fuse. Test light switch.
NO: If one light does not function: Go to next step.

KN52281,10043A1 -19-23OCT12-22/24

Continued on next page

Step 5



LVAL12015 —UN—17NOV10

C—Pur Wire
D—010 Blk Wire

Remove the bulb from the work light to be tested. Is battery voltage present at the Pur wire (C)?

YES: Go to next step.

NO: Check 147B or 147C, and 147A Pur wires and connections.

KN52281,10043A1 -19-23OCT12-23/24

Step 6

Is continuity to ground present at the 010 Blk wires at the work lights (D)?

NO: Check 010H or 010K, and 010C Blk wires and connections.

KN52281,10043A1 -19-23OCT12-24/24

Lights Circuit Diagnosis—MY13

Test Procedure A

NOTE: Test the bulb in each light circuit before beginning the diagnosis steps for the specific circuit.

Test Conditions

- Park brake locked.
- Key switch in off position.
- Light switch in marker position.
- Check circuit grounds for continuity as tests are performed.

KN52281,10043D1 -19-21JAN13-1/24

Marker Lights Circuit

KN52281,10043D1 -19-21JAN13-2/24

Step 1

Is left rear red light illuminated?

YES: Left rear marker light circuit is functional.

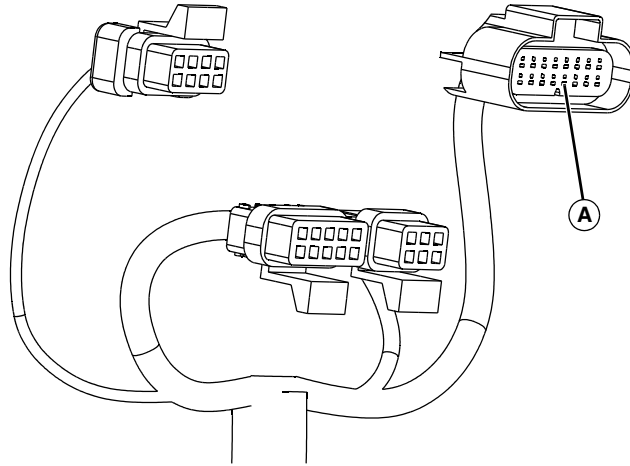
NO: Test the F9 fuse. Check the 128B and 128D Gry wires and connections. Go to next step.

Continued on next page

KN52281,10043D1 -19-21JAN13-3/24

Step 2	Is right front clear light illuminated?	YES: Right front marker light circuit is functional. NO: Check the 128B and 128E Gry wires and connections. Go to next step. KN52281,10043D1 -19-21JAN13-4/24
Step 3	Is right rear red light illuminated?	YES: Right rear marker light circuit is functional. NO: Test the F10 fuse. Check the 118B and 118D Gry wires and connections. Go to next step. KN52281,10043D1 -19-21JAN13-5/24
Step 4	Is left front clear light illuminated?	YES: Left front marker light circuit is functional. NO: Check the 118C and 118B Gry wires and connections. Go to next step. KN52281,10043D1 -19-21JAN13-6/24
Step 5	Is license plate light illuminated?	YES: License plate light circuit is functional. NO: Check the 118F and 118B Gry wires and connections. Go to next step. Continued on next page KN52281,10043D1 -19-21JAN13-7/24

Step 6



LVAL12011 —UN—17NOV10

A—X7 Connector Terminal M, 103C Org Wire

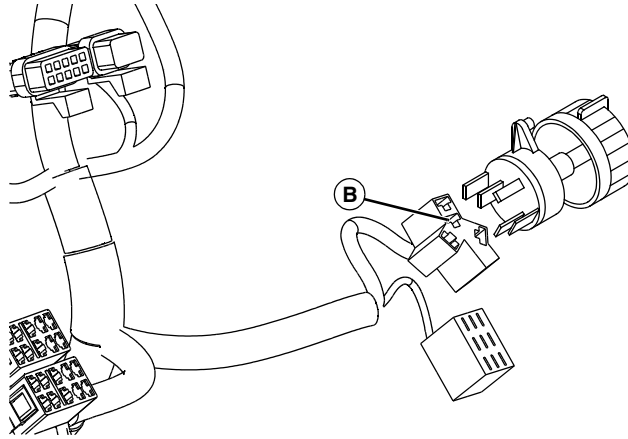
Disconnect X7 connector to the display panel. Is battery voltage present at terminal M, 103C Org wire (A)?

YES: Connect X7 connector. If display panel does not illuminate, check display panel ground circuit. Replace display panel as needed.

NO: Check 103C and 103A Org wires and connections. Test light switch.

KN52281,10043D1 -19-21JAN13-8/24

Step 7



LVAL12012 —UN—17NOV10

B—S3 Light Switch Connector, 122B Red Wire

Disconnect the light switch. Is battery voltage present at S3 light switch connector 122B Red wire (B)?

YES: Circuit is functional.

NO: Test unswitched power circuit. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

KN52281,10043D1 -19-21JAN13-9/24

Test Procedure B

Test Conditions

- Park brake locked.

- Key switch in off position.
- Light switch in road position.

Continued on next page

KN52281,10043D1 -19-21JAN13-10/24

Road Lights Circuit

KN52281,10043D1 -19-21JAN13-11/24

Step 1

Are the marker lights illuminated?

YES: Marker lights are functional. Go to next step.
NO: See "Marker Lights Circuit" above.

KN52281,10043D1 -19-21JAN13-12/24

Step 2

Is right headlight illuminated?

YES: Right headlight circuit is functional.
NO: Test bulb. Go to next step.

KN52281,10043D1 -19-21JAN13-13/24

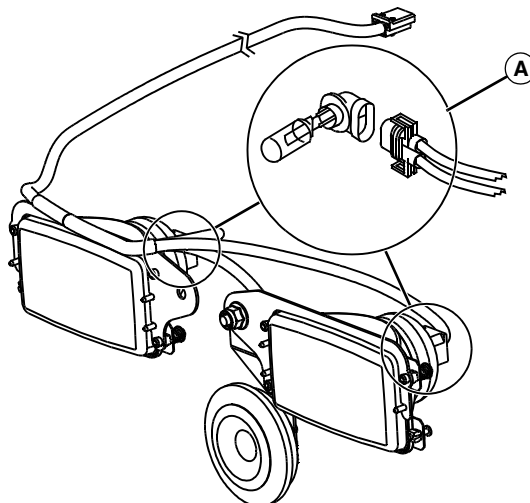
Step 3

Is left headlight illuminated?

YES: Left headlight circuit is functional.
NO: Test bulb. Go to next step.

KN52281,10043D1 -19-21JAN13-14/24

Step 4



LVAL12013 —UN—17NOV10

A—Headlight Light Bulb and Connector

Disconnect each light bulb connector. Is battery voltage present at the 119B and 119C Wht wires at the headlights (A)?

YES: Go to next step.

NO: Test F12 fuse. Test light switch. Check 138A Gry wire, 119A Wht, X3 connector, , and 119 Wht wires and connections.

KN52281,10043D1 -19-21JAN13-15/24

Step 5

Is continuity to ground present at the 010 Blk wires at the headlights (A)?

YES: Connect each light bulb connector. Go to next step.

NO: Check 010 Blk wires, X3 connector, 010A, and 010P Blk wires and connections.

Continued on next page

KN52281,10043D1 -19-21JAN13-16/24

Test Procedure C

Test Conditions

- Park brake locked.

- Key switch in off position.
- Light switch in field position.

KN52281,10043D1 -19-21JAN13-17/24

Field Lights Circuit

KN52281,10043D1 -19-21JAN13-18/24

Step 1

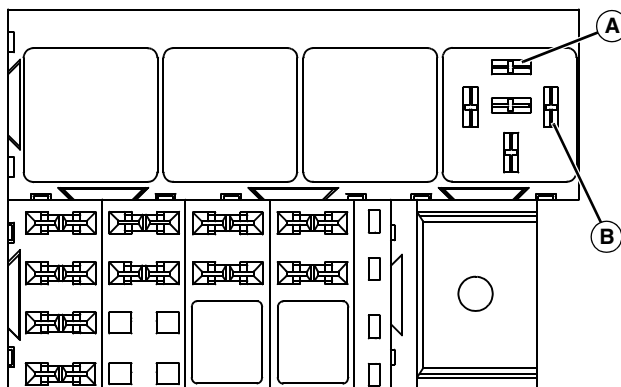
Are the marker lights illuminated?

YES: Skip next step.

NO: Go to next step.

KN52281,10043D1 -19-21JAN13-19/24

Step 2



LVAL12014 —UN—17NOV10

A—K4 Relay Socket Terminal 87, 122H Red Wire

B—K4 Relay Socket Terminal 86, 137C Pur Wire

Remove K4 lights relay. Is battery voltage present at K4 relay socket, terminal 87, 122H Red wire (A) and terminal 86, 137C Pur wire (B)?

YES: Test K4 relay.

Replace relay as needed.

Go to next step.

NO: Terminal 87: 122H

Red wire and connections.

NO: Terminal 86: Check for power at F8 fuse.

Check 137C Pur wire and connections.

KN52281,10043D1 -19-21JAN13-20/24

Step 3

Are headlights illuminated?

YES: Headlight circuit is functional.

NO: See "Road Lights Circuit" above.

KN52281,10043D1 -19-21JAN13-21/24

Step 4

Are all work lights illuminated?

YES: Work lights circuit is functional.

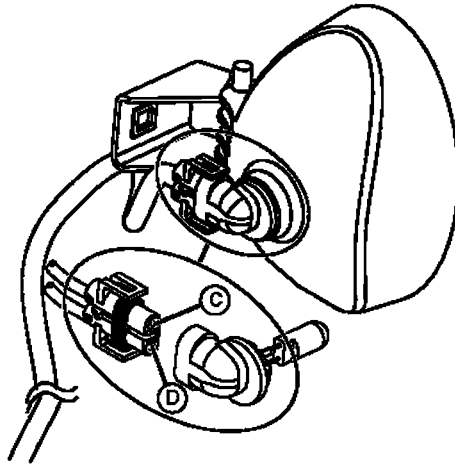
NO: If both lights do not function: Check F8 fuse. Test light switch.

NO: If one light does not function: Go to next step.

Continued on next page

KN52281,10043D1 -19-21JAN13-22/24

Step 5



LVAL41032 —UN—10JAN13

C—Pur Wire
D—010 Blk Wire

Remove the bulb from the work light to be tested. Is battery voltage present at the Pur wire (C)?

YES: Go to next step.

NO: Check 147B or 147C, and 147A Pur wires and connections.

KN52281,10043D1 -19-21JAN13-23/24

Step 6

Is continuity to ground present at the 010 Blk wires at the work lights (D)?

NO: Check 010H or 010K, and 010C Blk wires and connections.

KN52281,10043D1 -19-21JAN13-24/24

Brake Lights Circuit Diagnosis

Test Procedure A

Test Conditions:

- Park brake locked.
- Key switch in off position.
- Brake pedal depressed.

KN52281,10043A2 -19-30OCT12-1/9

Brake Lights Circuit

KN52281,10043A2 -19-30OCT12-2/9

Step 1

Are the brake (red) lights illuminated?

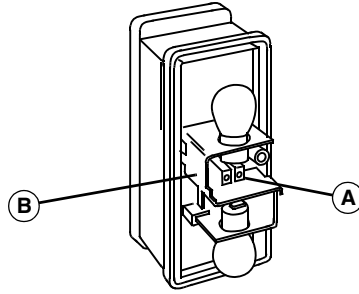
YES: Brake lights are functional. Go to next step.

NO: Test the brake light bulbs. Go to next step.

Continued on next page

KN52281,10043A2 -19-30OCT12-3/9

Step 2



LVAL12016 —UN—17NOV10

A—Blu Wire

B—Blk Wire

Remove the lens from the brake light to be tested. Is battery voltage present at the Blu wire (A)?

YES: Go to next step.

NO: Check the 136A, 136B, 136C, and 136D Blu wires and connections. Go to next step.

KN52281,10043A2 -19-30OCT12-4/9

Step 3

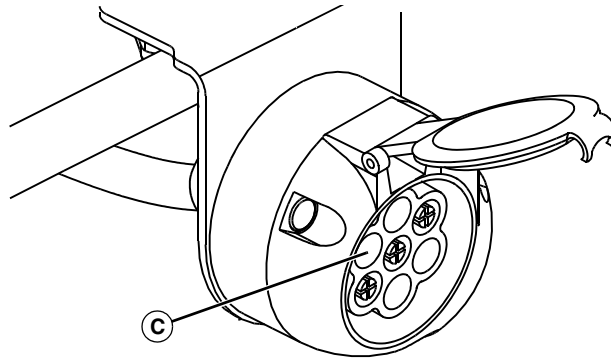
Is continuity to ground present at the Blk wire (B)?

YES: Install the lens. Go to next step.

NO: Check 010L, 010G, and 010C Blk wires and connections.

KN52281,10043A2 -19-30OCT12-5/9

Step 4



LVAL12017 —UN—17NOV10

C—X13 Trailer Connector, 136B Blu Wire

Is battery voltage present at X13 trailer connector 136B Blu wire (C)?

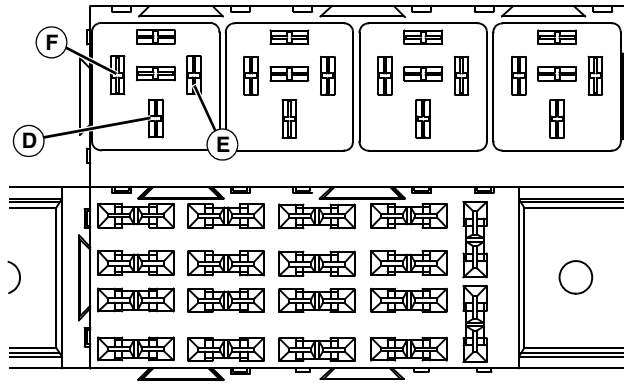
YES: Brake light circuit is functional.

NO: Check the 136A, 136B, 136C, and 136D Blu wires and connections. Go to next step.

Continued on next page

KN52281,10043A2 -19-30OCT12-6/9

Step 5



LVAL12018 —UN—17NOV10

D—K6 Brake Light Relay Terminal 30, 042D Red Wire

E—K6 Brake Light Relay Terminal 86, 116 Blu Wire

F—K6 Brake Light Relay Terminal 85, 010U Blk Wire

Remove K6 brake light relay. Is battery voltage present at K6 brake light relay, terminal 30, 042D Red wire (D) and terminal 86, 116 Blu wire (E)?

YES: Go to next step.

NO: Terminal 30: Check F6 fuse. Check 042C and 042D Red wires and connections.

NO: Terminal 86: Go to step (7) if problem continues. Test brake switch. Check 116 Blu wire and connections.

KN52281,10043A2 -19-30OCT12-7/9

Step 6

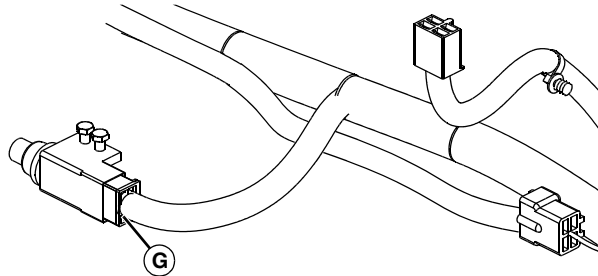
Is continuity to ground present at the terminal 85, 010U Blk wire (F)?

YES: If voltage is present at terminals 30, and 86, and continuity to ground is present at terminal 85, replace the brake light relay.

NO: Check 010U and 010P Blk wires and connections.

KN52281,10043A2 -19-30OCT12-8/9

Step 7



LVAL12019 —UN—17NOV10

G—S15 Brake Switch Terminal A, 042A Red Wire

Is battery voltage present at S15 brake switch, terminal A, 042A Red wire (G)?

YES: Test complete.

NO: Check F6 fuse. Check 042C and 042B Red wires and connections.

KN52281,10043A2 -19-30OCT12-9/9

Brake Lights Circuit Diagnosis—MY13

Test Procedure A

Test Conditions

- Park brake locked.
- Key switch in off position.
- Brake pedal depressed.

Continued on next page

AK82585,271AF2E -19-11JAN13-1/9

Brake Lights Circuit

AK82585,271AF2E -19-11JAN13-2/9

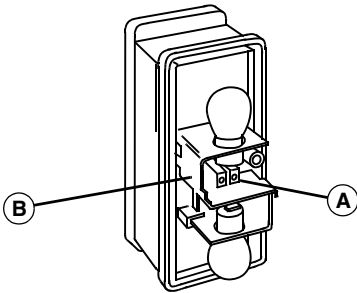
Step 1

Are the brake (red) lights illuminated?

YES: Brake lights are functional. Go to next step.
NO: Test the brake light bulbs. Go to next step.

AK82585,271AF2E -19-11JAN13-3/9

Step 2



LVAL12016 —UN—17NOV10

A—Blu Wire
B—Blk Wire

Remove the lens from the brake light to be tested. Is battery voltage present at the Blu wire (A)?

YES: Go to next step.
NO: Check the 136A, 136B, 136C, and 136D Blu wires and connections. Go to next step.

AK82585,271AF2E -19-11JAN13-4/9

Step 3

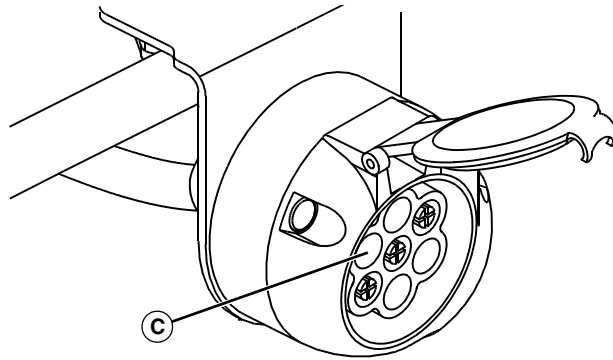
Is continuity to ground present at the Blk wire (B)?

YES: Install the lens. Go to next step.
NO: Check 010L, 010G, and 010C Blk wires and connections.

Continued on next page

AK82585,271AF2E -19-11JAN13-5/9

Step 4



LVAL12017 —UN—17NOV10

C—X13 Trailer Connector, 136B Blu Wire

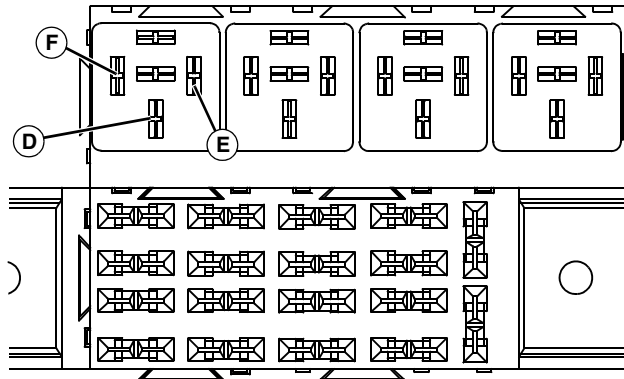
Is battery voltage present at X13 trailer connector 136B Blu wire (C)?

YES: Brake light circuit is functional.

NO: Check the 136A, 136B, 136C, and 136D Blu wires and connections. Go to next step.

AK82585,271AF2E -19-11JAN13-6/9

Step 5



LVAL12018 —UN—17NOV10

D—K6 Brake Light Relay Terminal 30, 042C Red Wire

E—K6 Brake Light Relay Terminal 86, 116 Blu Wire

F—K6 Brake Light Relay Terminal 85, 010AAC Blk Wire

Remove K6 brake light relay. Is battery voltage present at K6 brake light relay, terminal 30, 042C Red wire (D) and terminal 86, 116 Blu wire (E)?

YES: Go to next step.

NO: Terminal 30: Check F6 fuse. Check 042C and 042D Red wires and connections.

NO: Terminal 86: Go to step (7) if problem continues. Test brake switch. Check 116A Blu wire and connections.

AK82585,271AF2E -19-11JAN13-7/9

Step 6

Is continuity to ground present at the terminal 85, 010AAC Blk wire (F)?

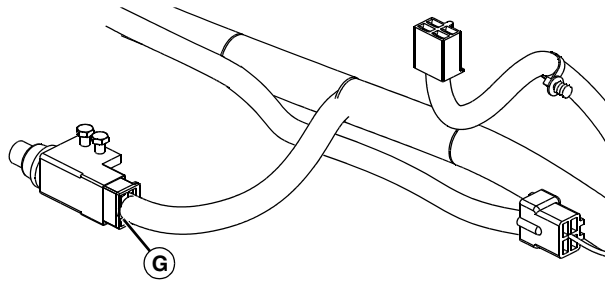
YES: If voltage is present at terminals 30, and 86, and continuity to ground is present at terminal 85, replace the brake light relay.

NO: Check 010AAC, 010AK, 010S, 010F, 010E, 010AL, and 010P Blk wires and connections.

Continued on next page

AK82585,271AF2E -19-11JAN13-8/9

Step 7



LVAL12019 —UN—17NOV10

G—S15 Brake Switch Terminal A, 042A Red Wire

Is battery voltage present at S15 brake switch, terminal A, 042D Red wire (G)?

YES: Test complete.

NO: Check F6 fuse. Check 042A and 042D Red wires and connections.

AK82585,271AF2E -19-11JAN13-9/9

Hazard Lights Circuit Operation

Function:

Provides intermittent current to the hazard lights.

Operating Conditions:

- Hazard light switch in the on position.

Theory of Operation:

The hazard light switch receives unswitched power through the F6 fuse, 042C and 042B Red wires, and switched power through the 072B and 072D Red wires.

The switched power is provided through the hazard lights switch to the flasher relay and on to the turn signal switch, (See [Turn Signal Lights Circuit Operation](#) in Section 50, Group 35.) The unswitched power is used to power the hazard lights.

With the hazard light switch in the off position, switched power is provided from the 072D Red wire, across the hazard light switch (terminals 1 and 2) to the 102 Red wire to the flasher relay. From the flasher relay, secondary switched power is provided to the 127C, 127B and 127A Pur wires. The 127A Pur wire provides power to the turn signal switch while the 127B Pur wire provides power back to the hazard light switch (terminal 5).

With the hazard switch in the on position, unswitched power is provided through the hazard switch (terminal

3 to terminal 2) and 102 Red wire to the flasher relay (terminal 49). The internal circuits of the flasher relay provide an intermittent output (terminal 49a) if a circuit path is provided through a load component (hazard lights) to the W1 frame ground.

The circuit path is created when the flasher relay output power is provided through the 127C and 127B Pur wires to the hazard switch input (terminal 5). The contacts in the hazard switch (terminal 5 to terminals 17 and 18) complete the circuit path to all of the turn/hazard lights through the Grn wires to the left front and rear turn/hazard lights, the right front and rear turn/hazard lights, the trailer connector (terminals 1 and 4) and the X6 connector (terminals D and E) to the A1 display panel. These connections cause the hazard lights to flash and the turn indicator lights on the display panel to flash.

Additionally, the flasher relay provides an input to the A1 display panel through the X11 connector (terminal E, F and G) on the 148 Gry, 146 Blu and 144 Yel wires. These inputs cause the bulb integrity, trailer 1, and trailer 2 indicator lights on the display panel to flash.

The hazard switch has an internal indicator light that is provided with intermittent power from the flasher relay and is grounded through the 050 Blk wire (terminal 10).

KN52281,10043A3 -19-23OCT12-1/1

Hazard Lights Circuit Operation—MY13

Function

Provides intermittent current to the hazard lights.

Operating Conditions

- Hazard light switch in the on position.

Theory of Operation

The hazard light switch receives unswitched power through the F6 fuse, 042A and 042B Red wires, and switched power through the 072B and 072D Red wires.

The switched power is provided through the hazard lights switch to the flasher relay and on to the turn signal switch, (See [Turn Signal Lights Circuit Operation](#).) The unswitched power is used to power the hazard lights.

With the hazard light switch in the OFF position, switched power is provided from the 072D Red wire, across the hazard light switch (terminals 1 and 2) to the 102 Red wire to the flasher relay. From the flasher relay, secondary switched power is provided to the 127C, 127B and 127A Pur wires. The 127A Pur wire provides power to the turn signal switch while the 127B Pur wire provides power back to the hazard light switch (terminal 5).

With the hazard switch in the on position, unswitched power is provided through the hazard switch (terminal

3 to terminal 2) and 102 Red wire to the flasher relay (terminal 49). The internal circuits of the flasher relay provide an intermittent output (terminal 49a) if a circuit path is provided through a load component (hazard lights) to the W1 frame ground.

The circuit path is created when the flasher relay output power is provided through the 127C and 127B Pur wires to the hazard switch input (terminal 5). The contacts in the hazard switch (terminal 5 to terminals 17 and 18) complete the circuit path to all of the turn/hazard lights through the Grn wires to the left front and rear turn/hazard lights, the right front and rear turn/hazard lights, the trailer connector (terminals 1 and 4) and the X6 connector (terminals D and E) to the A1 display panel. These connections cause the hazard lights to flash and the turn indicator lights on the display panel to flash.

Additionally, the flasher relay provides an input to the A1 display panel through the X11 connector (terminal E, F and G) on the 148 Gry, 146 Blu and 144 Yel wires. These inputs cause the bulb integrity, trailer 1, and trailer 2 indicator lights on the display panel to flash.

The hazard switch has an internal indicator light that is provided with intermittent power from the flasher relay and is grounded through the 050 Blk wire (terminal 10).

AK82585,271AF2F -19-11JAN13-1/1

A1—Display Panel
F1—Fusible Link
F3—Fuse 30A
F5—Fuse 30A
F6—Fuse 20A
F7—Fuse 20A

G1—Battery
K7—Flasher Relay
M1—Starting Motor
S2—Key Switch
X6—W1 Main Wiring Harness to
A1 Display Panel

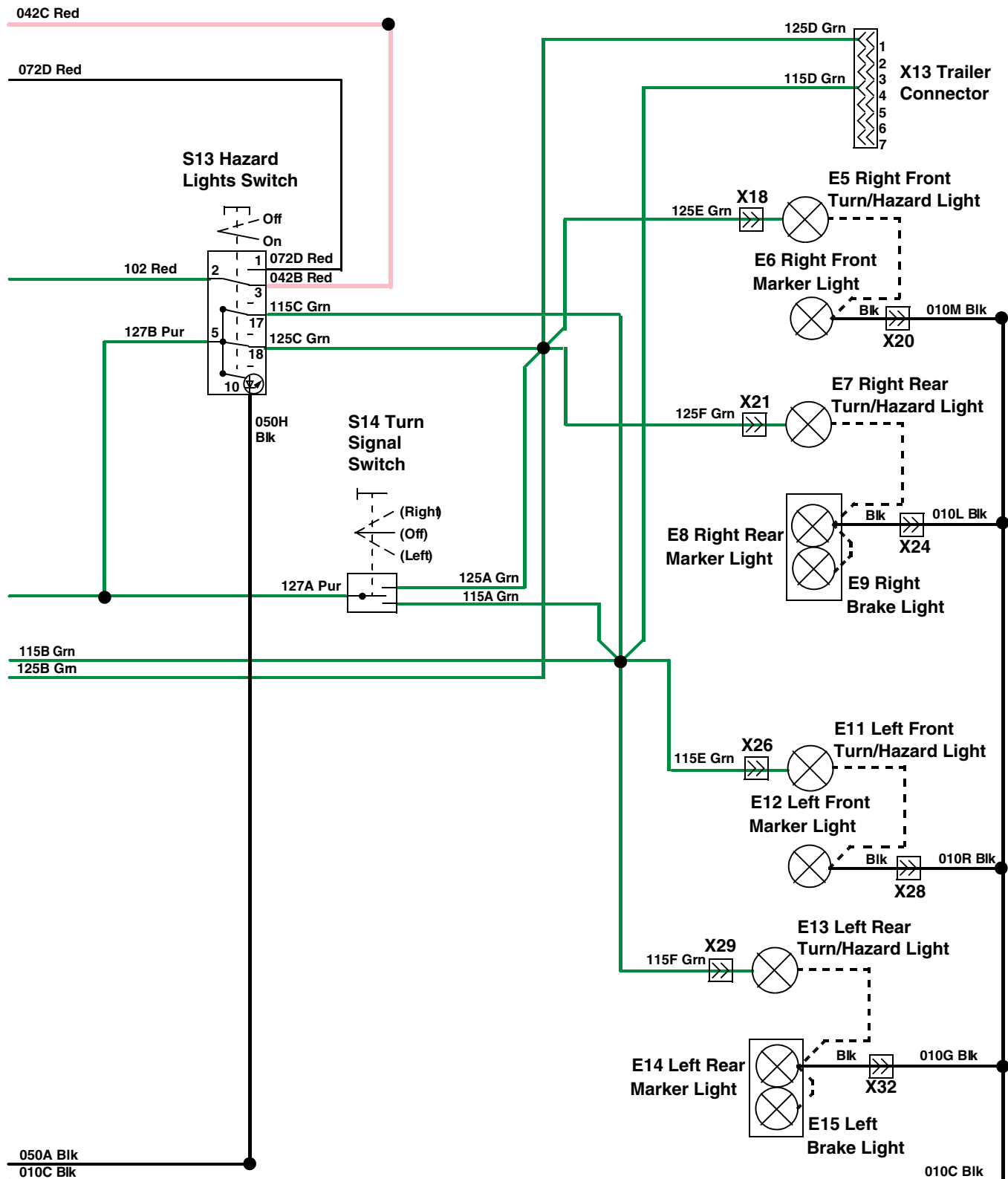
X7—W1 Main Wiring Harness to
A1 Display Panel
X10—W1 Main Wiring Harness
to A1 Display Panel

X11—W1 Main Wiring Harness
to A1 Display Panel

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KN52281,10043A4 -19-07DEC12-2/6

Hazard Lights Schematic to Model Year 2007



LVAL12021 —UN—17NOV10

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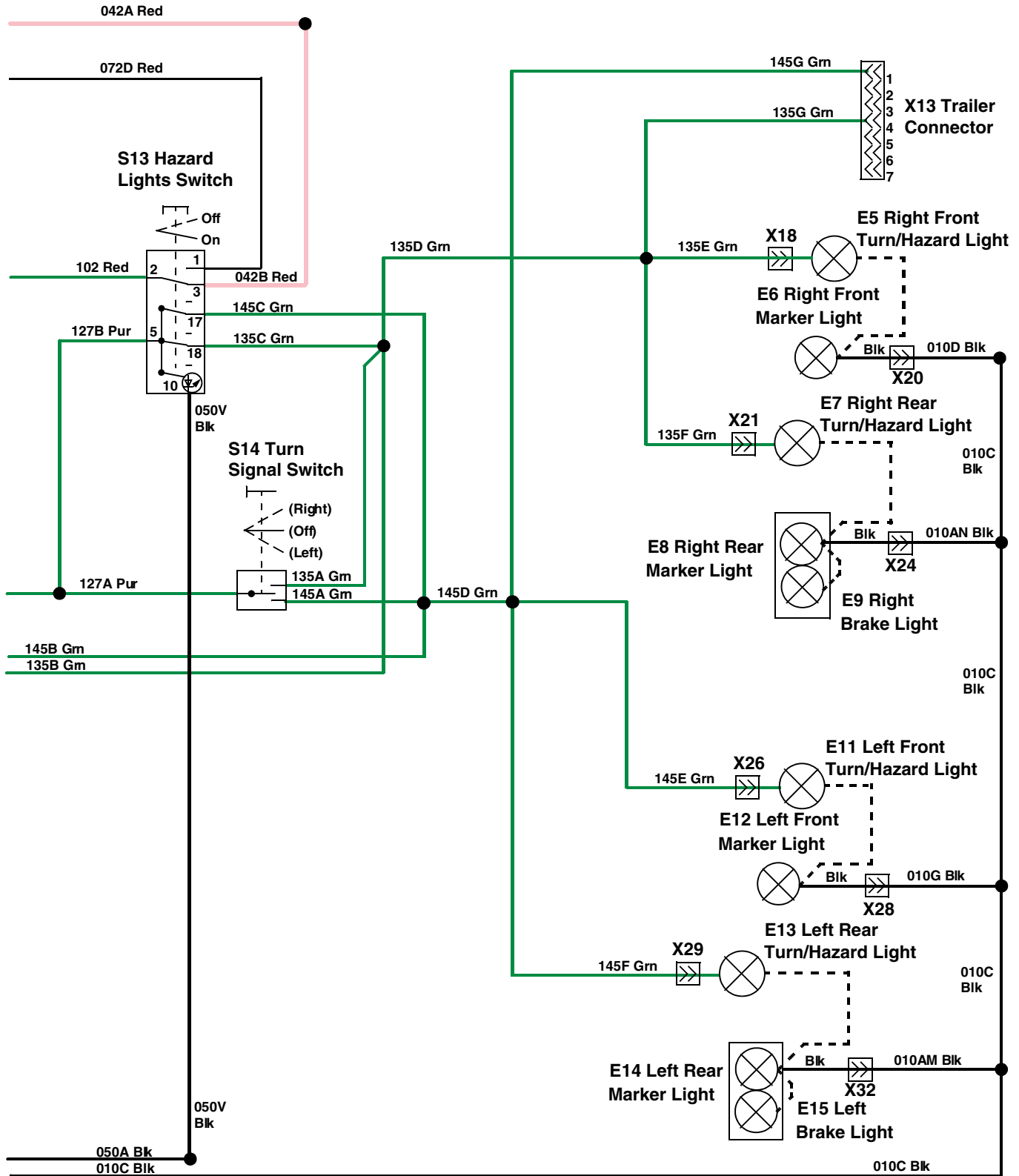
KN52281,10043A4 -19-07DEC12-3/6

E5— Right Front Turn/Hazard Light	E14— Left Rear Marker Light	X21— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X29— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E6— Right Front Marker Light	E15— Left Brake Light		
E7— Right Rear Turn/Hazard Light	S13— Hazard Lights Switch	X24— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X32— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E8— Right Rear Marker Light	S14— Turn Signal Switch		
E9— Right Brake Light	X13— W1 Main Wiring Harness Trailer Connector	X26— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
E11— Left Front Turn/Hazard Light	X18— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X28— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
E12— Left Front Marker Light	X20— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness		
E13— Left Rear Turn/Hazard Light			

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KN52281,10043A4 -19-07DEC12-4/6

Hazard Lights Schematic from Model Year 2008



LVAL12022 —UN—17NOV10

Continued on next page

KN52281,10043A4 -19-07DEC12-5/6

E5— Right Front Turn/Hazard Light	E14— Left Rear Marker Light	X21— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X29— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E6— Right Front Marker Light	E15— Left Brake Light		
E7— Right Rear Turn/Hazard Light	S13— Hazard Lights Switch	X24— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X32— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E8— Right Rear Marker Light	S14— Turn Signal Switch		
E9— Right Brake Light	X13— W1 Main Wiring Harness Trailer Connector	X26— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
E11— Left Front Turn/Hazard Light	X18— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X28— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
E12— Left Front Marker Light	X20— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness		
E13— Left Rear Turn/Hazard Light			

KN52281,10043A4 -19-07DEC12-6/6

Hazard Lights Circuit Electrical Schematic—MY13



KN52281,10043D2 -19-11JAN13-1/4

A1—Display Panel
F1— Fusible Link
F3— Fuse 30A
F5— Fuse 30A
F6— Fuse 20A
F7— Fuse 20A

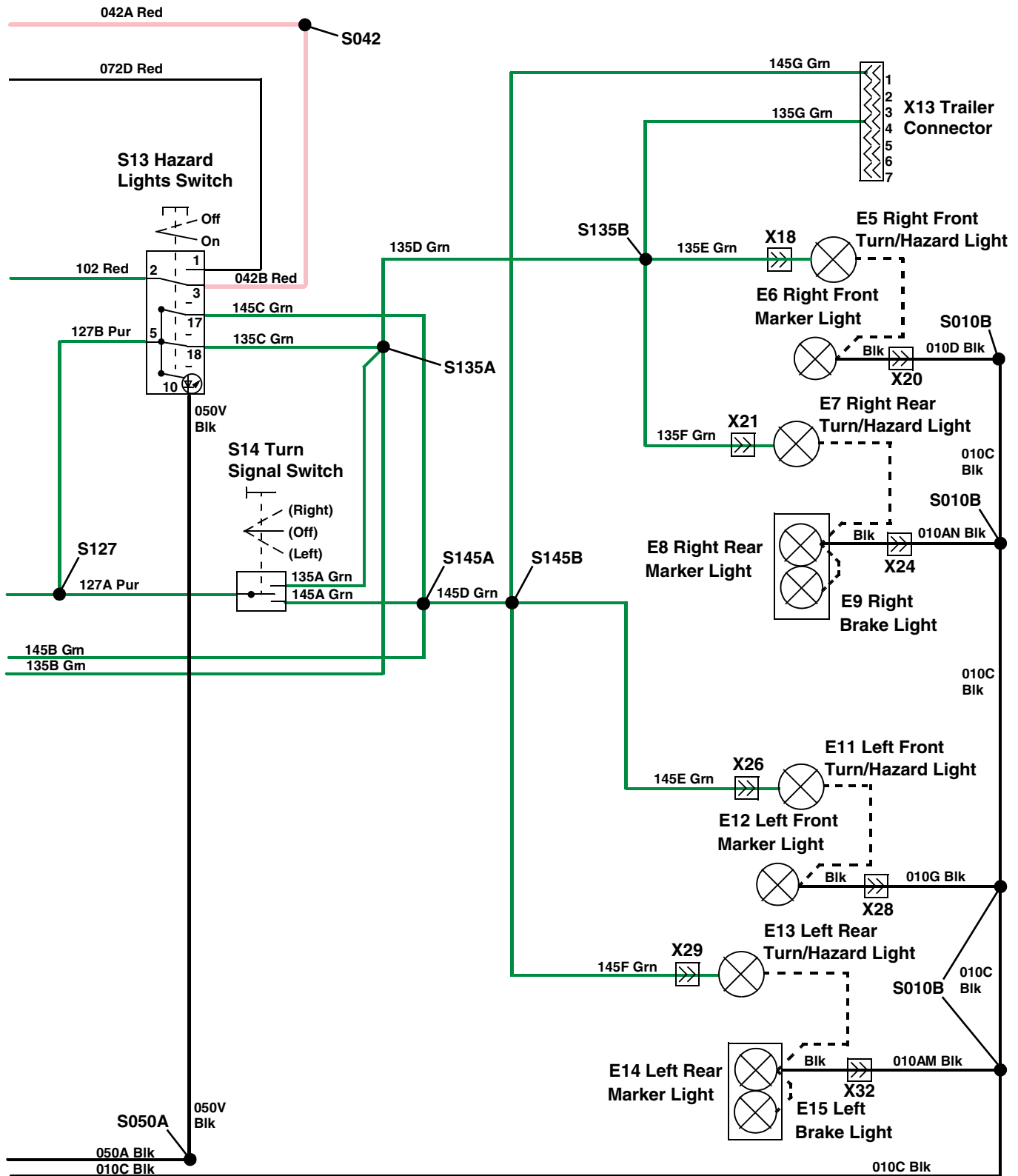
G1—Battery
K7—Flasher Relay
M1—Starting Motor
S2— Key Switch
X6— W1 Main Wiring Harness to
A1 Display Panel

X7— W1 Main Wiring Harness to
A1 Display Panel
X10— W1 Main Wiring Harness
to A1 Display Panel

X11— W1 Main Wiring Harness
to A1 Display Panel

Continued on next page

KN52281,10043D2 -19-11JAN13-2/4



LVAL38894—UN—26NOV12

Continued on next page

KN52281,10043D2 -19-11JAN13-3/4

E5— Right Front Turn/Hazard Light	E14— Left Rear Marker Light	X21— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X29— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E6— Right Front Marker Light	E15— Left Brake Light		
E7— Right Rear Turn/Hazard Light	S13— Hazard Lights Switch	X24— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X32— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E8— Right Rear Marker Light	S14— Turn Signal Switch		
E9— Right Brake Light	X13— W1 Main Wiring Harness Trailer Connector	X26— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
E11— Left Front Turn/Hazard Light	X18— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X28— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
E12— Left Front Marker Light	X20— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness		
E13— Left Rear Turn/Hazard Light			

KN52281,10043D2 -19-11JAN13-4/4

Hazard Lights Circuit Diagnosis

Test Procedure A

NOTE: Test the bulb in each light circuit before beginning the diagnosis steps for the specific circuit.

Test Conditions:

- Park brake locked.
- Key switch in run position, engine off.
- Hazard switch in the on position.

KN52281,10043A5 -19-23OCT12-1/9

Hazard Lights Circuit

KN52281,10043A5 -19-23OCT12-2/9

Step 1

Are the front and rear left amber lights flashing?

YES: Left hazard light circuit is functional.

NO: To MY07: Test the bulb(s) for the light(s) not flashing. Check the 115C, 115E and 115F Grn wires and connections. Test the hazard lights switch. Go to next step.

NO: From MY08: Test the bulb(s) for the light(s) not flashing. Check the 145C, 145E and 145F Grn wires and connections. Test the hazard lights switch. Go to next step.

KN52281,10043A5 -19-23OCT12-3/9

Step 2

Are the front and rear right amber lights flashing?

YES: Right hazard light circuit is functional.

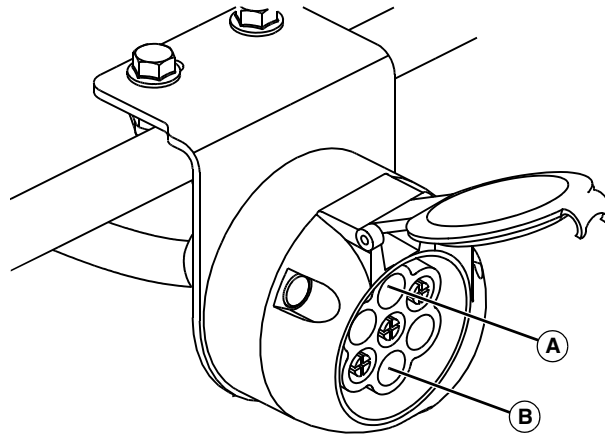
NO: To MY07: Test the bulb(s) for the light(s) not flashing. Check the 125C, 125E and 125F Grn wires and connections. Test the hazard lights switch. Go to next step.

NO: From MY08: Test the bulb(s) for the light(s) not flashing. Check the 135C, 135E and 135F Grn wires and connections. Test the hazard lights switch. Go to next step.

KN52281,10043A5 -19-23OCT12-4/9

Continued on next page

Step 3



LVAL12023 —UN—17NOV10

A—X13 Trailer Connector Wire
B—X13 Trailer Connector Wire

Is intermittent voltage present at X13 trailer connector wires (A) and (B)?

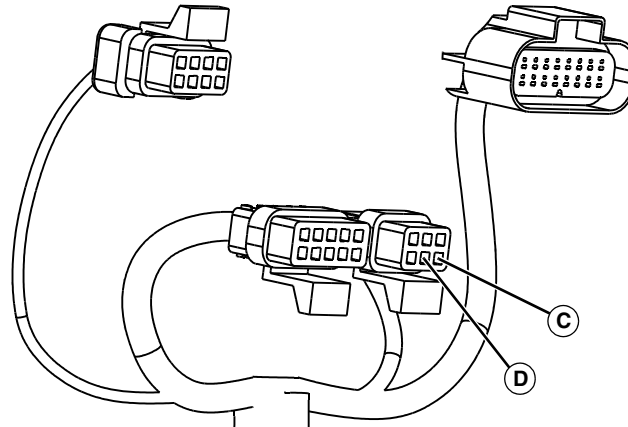
YES: Right and left hazard light circuit is functional.

NO: To MY07: Check the 125C, 125D, 115C and 115D Grn wires and connections. Test the hazard lights switch. Go to next step.

NO: From MY08: Check the 135C, 135D, 145C and 145D Grn wires and connections. Test the hazard lights switch. Go to next step.

KN52281,10043A5 -19-23OCT12-5/9

Step 4



LVAL12024 —UN—17NOV10

C—X6 Connector Terminal Grn Wire
D—X6 Connector Terminal Grn Wire

Disconnect X6 connector to the display panel. Is intermittent voltage present at terminals D and E, Grn wires (C and D)?

YES: Connect X6 connector. Hazard light circuit is functional. If turn indicator lights do not flash, replace the display panel. Go to next step.

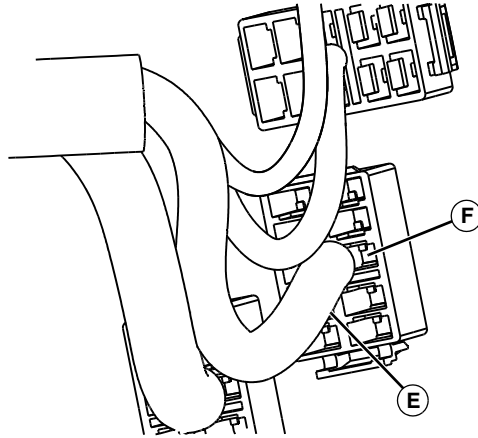
NO: To MY07: Check the 125C, 125B, 115C and 115B Grn wires and connections. Test the hazard lights switch. Go to next step.

NO: From MY08: Check the 135C, 135B, 145C and 145B Grn wires and connections. Test the hazard lights switch. Go to next step.

Continued on next page

KN52281,10043A5 -19-23OCT12-6/9

Step 5



LVAL12025 —UN—17NOV10

E—S13 Hazard Lights Switch Terminal 3, 042B Red Wire
F—S13 Hazard Lights Switch Terminal 5, 127B Pur Wire

Is battery voltage present at S13 hazard lights switch terminal 3, 042B Red wire (E)?

YES: Go to next step.

NO: Check F6 fuse. Check 042C and 042B Red wires and connections. Go to next step.

KN52281,10043A5 -19-23OCT12-7/9

Step 6

Is battery voltage present at S13 hazard lights switch terminal 5, 127B Pur wire (F)?

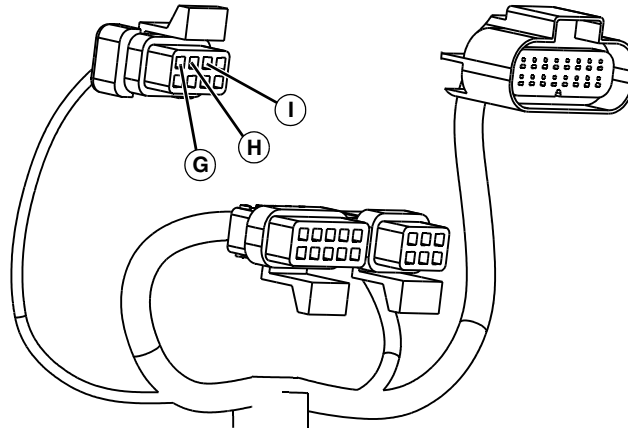
YES: Go to next step.

NO: Check the 127C and 127B Pur wires and 050J Blk wire. Check for voltage at 102 Red wire. Test hazard lights switch. If ok, replace flasher relay.

Continued on next page

KN52281,10043A5 -19-23OCT12-8/9

Step 7



LVAL12026 —UN—17NOV10

G—X11 Connector Terminal E, 148 Gry Wire
H—X11 Connector Terminal F, 146 Blu Wire
I— X11 Connector Terminal G, 144 Yel Wire

Disconnect X11 connector to the display panel. Is intermittent voltage present at terminals E, F, and G, 148 Gry (G), 146 Blu (H) and 144 Yel (I) wires?

YES: Connect X11 connector. Flasher indicator light circuit is functional. If bulb integrity and trailer 1 and 2 indicator lights do not flash, replace the display panel. Go to next step.

NO: Check the 148 Gry, 146 Blu and 144 Yel wires and 050J Blk wire and connections. If ok, replace the flasher relay. Go to next step.

KN52281,10043A5 -19-23OCT12-9/9

Hazard Lights Circuit Diagnosis—MY13

Test Procedure A

NOTE: Test the bulb in each light circuit before beginning the diagnosis steps for the specific circuit.

Test Conditions

- Park brake locked.
- Key switch in run position, engine off.
- Hazard switch in the on position.

AK82585,271AF30 -19-11JAN13-1/9

Hazard Lights Circuit

AK82585,271AF30 -19-11JAN13-2/9

Step 1

Are the front and rear left amber lights flashing?

YES: Left hazard light circuit is functional.

NO: Test the bulb(s) for the light(s) not flashing. Check the 145C, 145D, 145E and 145F Grn wires and connections. Test the hazard lights switch. Go to next step.

Continued on next page

AK82585,271AF30 -19-11JAN13-3/9

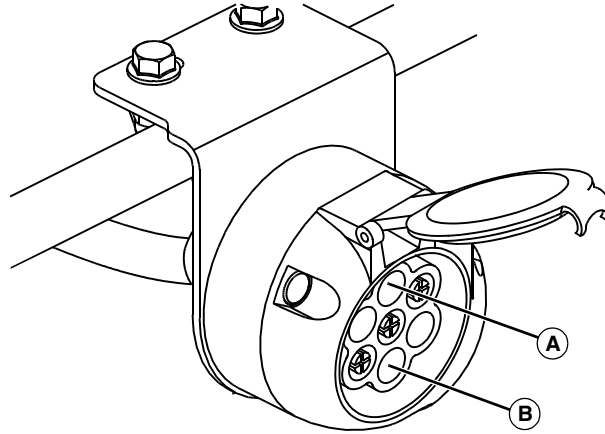
Step 2

Are the front and rear right amber lights flashing?

YES: Right hazard light circuit is functional.
NO: Test the bulb(s) for the light(s) not flashing. Check the 135C, 135E and 135F Grn wires and connections. Test the hazard lights switch. Go to next step.

AK82585,271AF30 -19-11JAN13-4/9

Step 3



LVAL12023 —UN—17NOV10

A—X13 Trailer Connector Wire
B—X13 Trailer Connector Wire

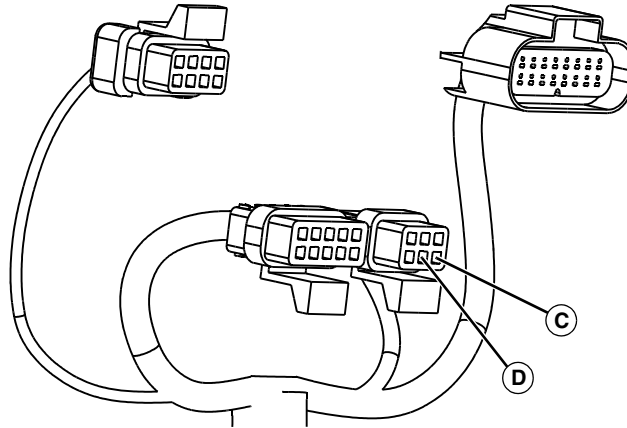
Is intermittent voltage present at X13 trailer connector wires (A) and (B)?

YES: Right and left hazard light circuit is functional.
NO: Check the 135C, 135D, 135G, 145C, 145D and 145G Grn wires and connections. Test the hazard lights switch. Go to next step.

Continued on next page

AK82585,271AF30 -19-11JAN13-5/9

Step 4



LVAL12024 —UN—17NOV10

C—X6 Connector Terminal Grn Wire
D—X6 Connector Terminal Grn Wire

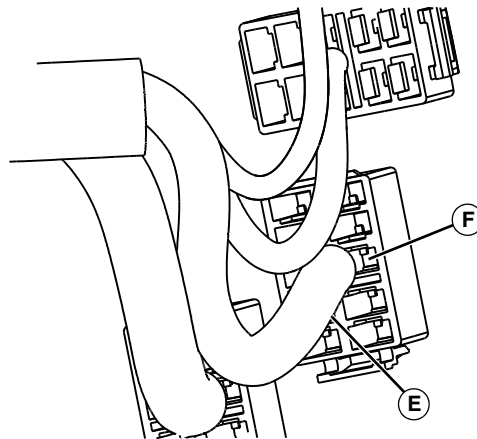
Disconnect X6 connector to the display panel. Is intermittent voltage present at terminals D and E, Grn wires (C and D)?

YES: Connect X6 connector. Hazard light circuit is functional. If turn indicator lights do not flash, replace the display panel. Go to next step.

NO: Check the 135C, 135B, 145C and 145B Grn wires and connections. Test the hazard lights switch. Go to next step.

AK82585,271AF30 -19-11JAN13-6/9

Step 5



LVAL12025 —UN—17NOV10

E—S13 Hazard Lights Switch Terminal 3, 042B Red Wire
F—S13 Hazard Lights Switch Terminal 5, 127B Pur Wire

Is battery voltage present at S13 hazard lights switch terminal 3, 042B Red wire (E)?

YES: Go to next step.

NO: Check F6 fuse. Check 042A and 042B Red wires and connections. Go to next step.

Continued on next page

AK82585,271AF30 -19-11JAN13-7/9

Step 6

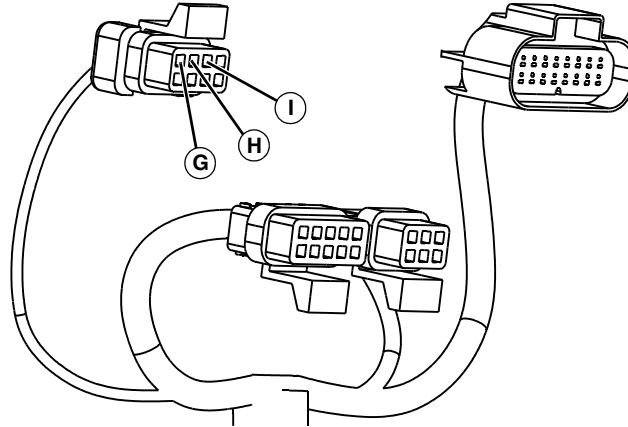
Is battery voltage present at S13 hazard lights switch terminal 5, 127B Pur wire (F)?

YES: Go to next step.

NO: Check the 127C and 127B Pur wires and 050V and 050A Blk wires. Check for voltage at 102 Red wire. Test hazard lights switch. If ok, replace flasher relay.

AK82585,271AF30 -19-11JAN13-8/9

Step 7



LVAL12026 —UN—17NOV10

G—X11 Connector Terminal E, 148 Gry Wire
H—X11 Connector Terminal F, 146 Blu Wire
I— X11 Connector Terminal G, 144 Yel Wire

Disconnect X11 connector to the display panel. Is intermittent voltage present at terminals E, F, and G, 148 Gry (G), 146 Blu (H) and 144 Yel (I) wires?

YES: Connect X11 connector. Flasher indicator light circuit is functional. If bulb integrity and trailer 1 and 2 indicator lights do not flash, replace the display panel. Go to next step.

NO: Check the 148 Gry, 146 Blu and 144 Yel wires and 050U Blk wire and connections. If ok, replace the flasher relay. Go to next step.

AK82585,271AF30 -19-11JAN13-9/9

Turn Signal Lights Circuit Operation

Turn Signal Switch Function:

Provides intermittent power to either the left front and rear turn/hazard lights and control panel turn indicator light, or the right front and rear turn/hazard lights and control panel turn indicator light.

Operating Condition:

- Key switch in the run position,
- and,
- Hazard lights switch in the off position,
- and,
- Turn signal switch in the left position, light switch in any position,
- or,
- Turn signal switch in the right position, light switch in any position.

Theory of Operation:

Switched power is provided from the key switch (terminal 5) through the 072B and 072D Red wires to the hazard switch (terminal 1).

With the hazard switch in the off position, the switched power is provided through the hazard switch (terminal 1 to terminal 2) and 102 Red wire to the flasher (terminal 49).

Secondary switched power is provided to the turn signal switch (terminal 2) from the flasher relay and the 127C and 127A Pur wires.

The internal circuits of the flasher provide an intermittent output (terminal 49a) if a circuit path is provided through a load component to the W1 frame ground. Placing the turn signal switch in either the right or left position provides a circuit path through a load component (turn/hazard lights) to ground.

Turn Signal Switch Left Position:

With the turn signal switch in the left position (as shown), intermittent power is provided to the 115A Grn wire (models up to 2007) or the 145C Grn wire (starting model year 2008).

The 115A Grn wire splices with the 115B, 115C, 115D, 115E and 115F Grn wires.

The 145A Grn wire splices 145B, 145C and the 145D Grn wires; and the 145D splices with the 145E, 145F and 145G Grn wires.

These wires connect and provide intermittent power to the display panel at the X6 connector (terminal E), the hazard lights switch (terminal 17), the trailer connector, the left front turn/hazard light and the left rear turn/hazard light.

The intermittent power to the left lights causes them to flash.

The intermittent power to the display (X6 terminal E) causes the left turn signal indicator light on the display panel to flash.

At the same time the flasher relay provides voltage to the display panel on the 148 Gry wire. This input along with the input from the X6 connector (terminal E) Grn wire cause the display panel logic to flash the bulb integrity light.

The ground path for the left turn signal light and hazard light is provided by 010 Blk wires.

Turn Signal Switch Right Position:

With the turn signal switch in the right position, intermittent power is provided to the 125A Grn wire (models up to 2007) or the 135A Grn wire (starting model year 2008).

The 125A Grn wire splices with the 125B, 125C, 125D, 125E and 125F Grn wires.

The 135A Grn wire splices 135B, 143C and the 135D Grn wires; and the 135D splices with the 135E, 135F and 135G Grn wires.

These wires connect and provide intermittent power to the display panel at the X6 connector terminal D, the hazard lights switch, the trailer connector, the right front turn/hazard light, and the right rear turn/hazard light respectively.

The intermittent power to the right lights causes them to flash.

The intermittent power to the display (X6 terminal D) causes the right turn signal indicator light on the display panel to flash.

At the same time the flasher relay provides voltage to the display panel on the 148 Gry wire. This input along with the input from the 125B Grn wire cause the display panel logic to flash the bulb integrity light.

The ground path for the right turn signal light and hazard light is provided by 010 Blk wires.

KN52281,10043A6 -19-23OCT12-1/1

Turn Signal Lights Circuit Operation—MY13

Turn Signal Switch Function

Provides intermittent power to either the left front and rear turn/hazard lights and control panel turn indicator light, or the right front and rear turn/hazard lights and control panel turn indicator light.

Operating Condition

- Key switch in the run position.
- Hazard lights switch in the off position.
- Turn signal switch in the left position, light switch in any position.

or,

- Turn signal switch in the right position, light switch in any position.

Theory of Operation

Switched power is provided from the key switch (terminal 5) through the 072B and 072D Red wires to the hazard switch (terminal 1).

With the hazard switch in the off position, the switched power is provided through the hazard switch (terminal 1 to terminal 2) and 102 Red wire to the flasher (terminal 49).

Secondary switched power is provided to the turn signal switch (terminal 2) from the flasher relay and the 127C and 127A Pur wires.

The internal circuits of the flasher provide an intermittent output (terminal 49a) if a circuit path is provided through a load component to the W1 frame ground. Placing the turn signal switch in either the right or left position provides a circuit path through a load component (turn/hazard lights) to ground.

Turn Signal Switch Left Position

With the turn signal switch in the left position (as shown), intermittent power is provided to the 145C Grn wire.

The 145A Grn wire splices 145B, 145C and the 145D Grn wires; and the 145D splices with the 145E, 145F and 145G Grn wires.

These wires connect and provide intermittent power to the display panel at the X6 connector (terminal E), the hazard lights switch (terminal 17), the trailer connector, the left front turn/hazard light and the left rear turn/hazard light.

The intermittent power to the left lights causes them to flash.

The intermittent power to the display (X6 terminal E) causes the left turn signal indicator light on the display panel to flash.

At the same time the flasher relay provides voltage to the display panel on the 148 Gry wire. This input along with the input from the X6 connector (terminal E) 145B Grn wire cause the display panel logic to flash the bulb integrity light.

The ground path for the left turn signal light and hazard light is provided by 010 Blk wires.

Turn Signal Switch Right Position

With the turn signal switch in the right position, intermittent power is provided to the 135A Grn wire.

The 135A Grn wire splices 135B, 143C and the 135D Grn wires; and the 135D splices with the 135E, 135F and 135G Grn wires.

These wires connect and provide intermittent power to the display panel at the X6 connector terminal D, the hazard lights switch, the trailer connector, the right front turn/hazard light, and the right rear turn/hazard light respectively.

The intermittent power to the right lights causes them to flash.

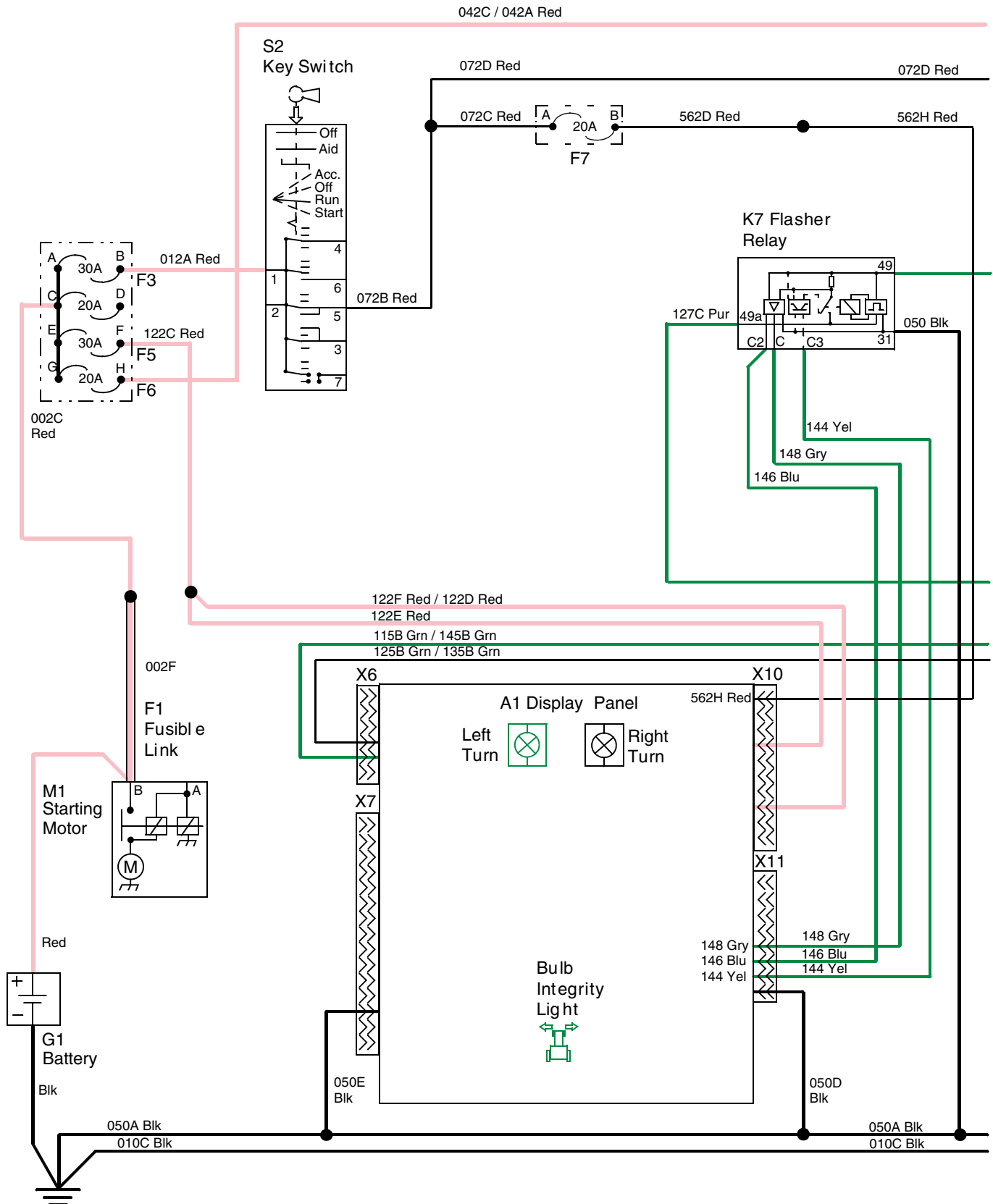
The intermittent power to the display (X6 terminal D) causes the right turn signal indicator light on the display panel to flash.

At the same time the flasher relay provides voltage to the display panel on the 148 Gry wire. This input along with the input from the 135B Grn wire cause the display panel logic to flash the bulb integrity light.

The ground path for the right turn signal light and hazard light is provided by 010 Blk wires.

AK82585,271AF31 -19-11JAN13-1/1

Turn Signal Circuit Electrical Schematic



LVAL12027—UN—17NOV10

Continued on next page

KN52281,10043A7 -19-07DEC12-1/6

A1—Display Panel
F1— Fusible Link
F3— Fuse 30A
F5— Fuse 30A
F6— Fuse 20A
F7— Fuse 20A

G1—Battery
K7—Flasher Relay
M1—Starting Motor
S2— Key Switch
X6— W1 Main Wiring Harness to
A1 Display Panel

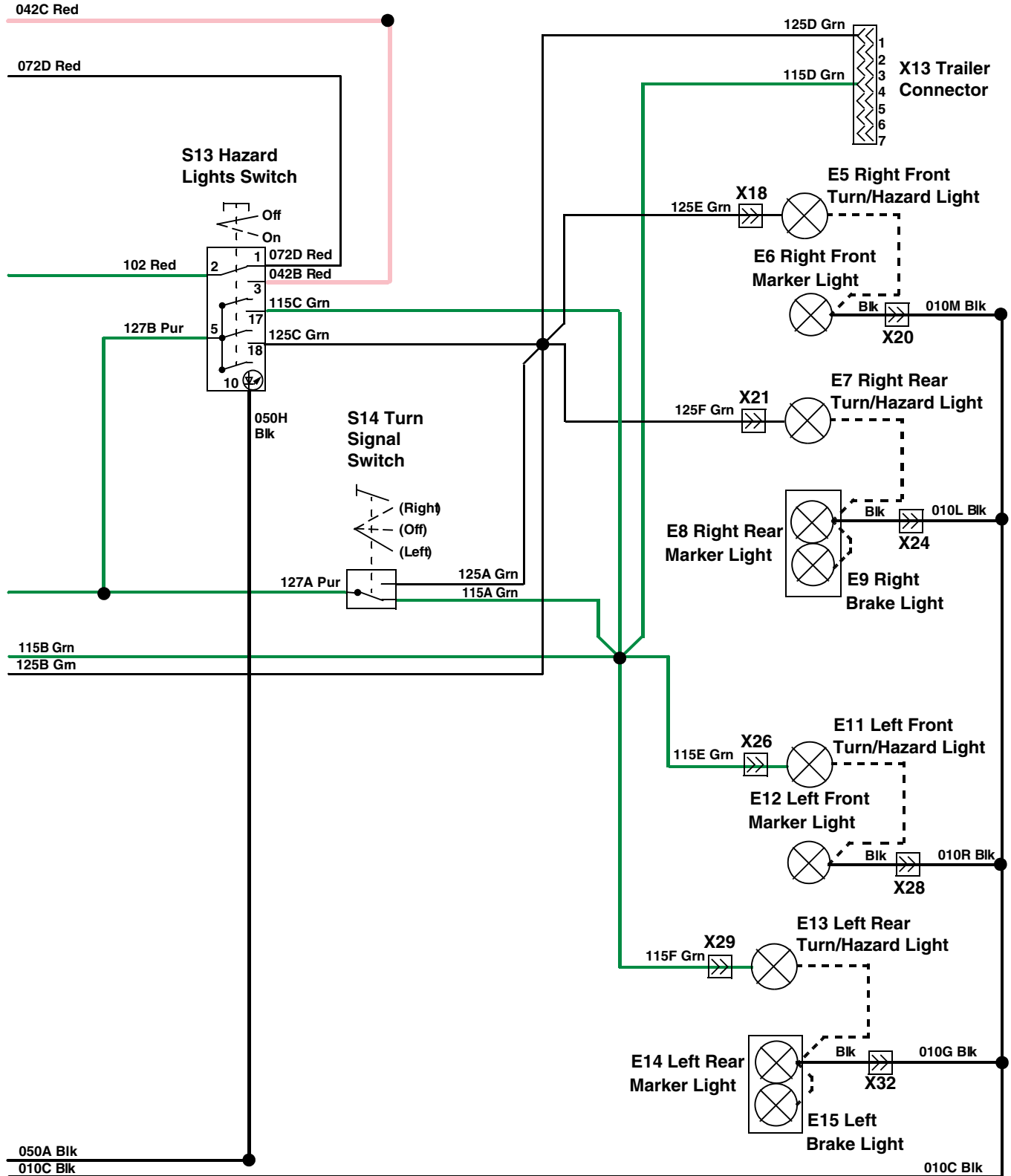
X7— W1 Main Wiring Harness to
A1 Display Panel
X10— W1 Main Wiring Harness
to A1 Display Panel

X11— W1 Main Wiring Harness
to A1 Display Panel

Continued on next page

KN52281,10043A7 -19-07DEC12-2/6

Hazard Lights Schematic to Model Year 2007



LVAL12028 —UN—17NOV10

Continued on next page

KN52281,10043A7 -19-07DEC12-3/6

E5— Right Front Turn/Hazard Light	E14— Left Rear Marker Light	X21— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X29— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E6— Right Front Marker Light	E15— Left Brake Light		
E7— Right Rear Turn/Hazard Light	S13— Hazard Lights Switch	X24— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X32— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E8— Right Rear Marker Light	S14— Turn Signal Switch		
E9— Right Brake Light	X13— W1 Main Wiring Harness Trailer Connector	X26— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
E11— Left Front Turn/Hazard Light	X18— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X28— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
E12— Left Front Marker Light	X20— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness		
E13— Left Rear Turn/Hazard Light			

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KN52281,10043A7 -19-07DEC12-4/6

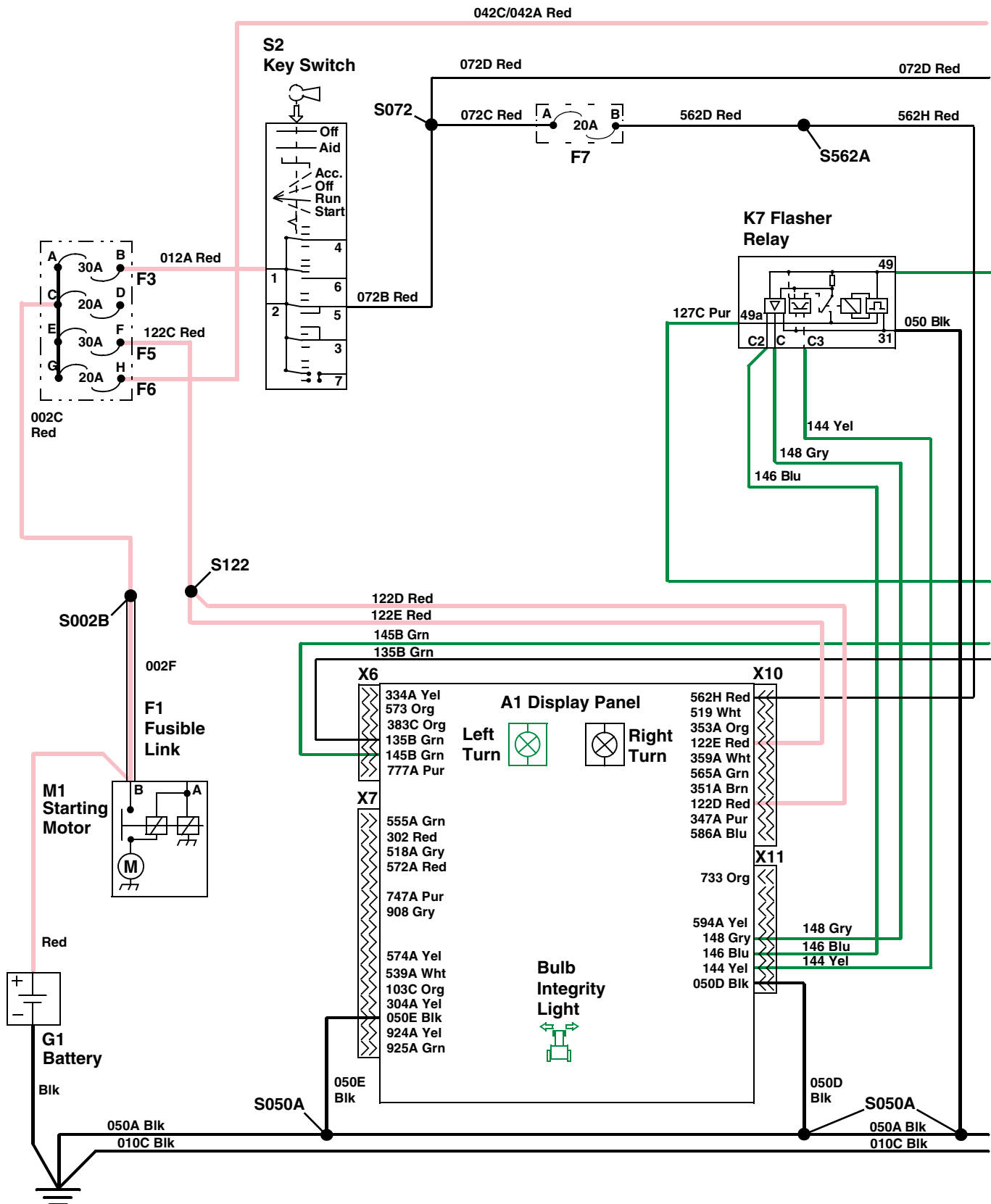
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TM2138 (23JAN13)

E5— Right Front Turn/Hazard Light	E14— Left Rear Marker Light	X21— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X29— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E6— Right Front Marker Light	E15— Left Brake Light		
E7— Right Rear Turn/Hazard Light	S13— Hazard Lights Switch	X24— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X32— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E8— Right Rear Marker Light	S14— Turn Signal Switch		
E9— Right Brake Light	X13— W1 Main Wiring Harness Trailer Connector	X26— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
E11— Left Front Turn/Hazard Light	X18— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X28— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
E12— Left Front Marker Light	X20— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness		
E13— Left Rear Turn/Hazard Light			

KN52281,10043A7 -19-07DEC12-6/6

Turn Signal Circuit Electrical Schematic—MY13



LVAL38895—UN—26NOV12

Continued on next page

KN52281,10043D3 -19-11JAN13-1/4

A1—Display Panel
F1— Fusible Link
F3— Fuse 30A
F5— Fuse 30A
F6— Fuse 20A
F7— Fuse 20A

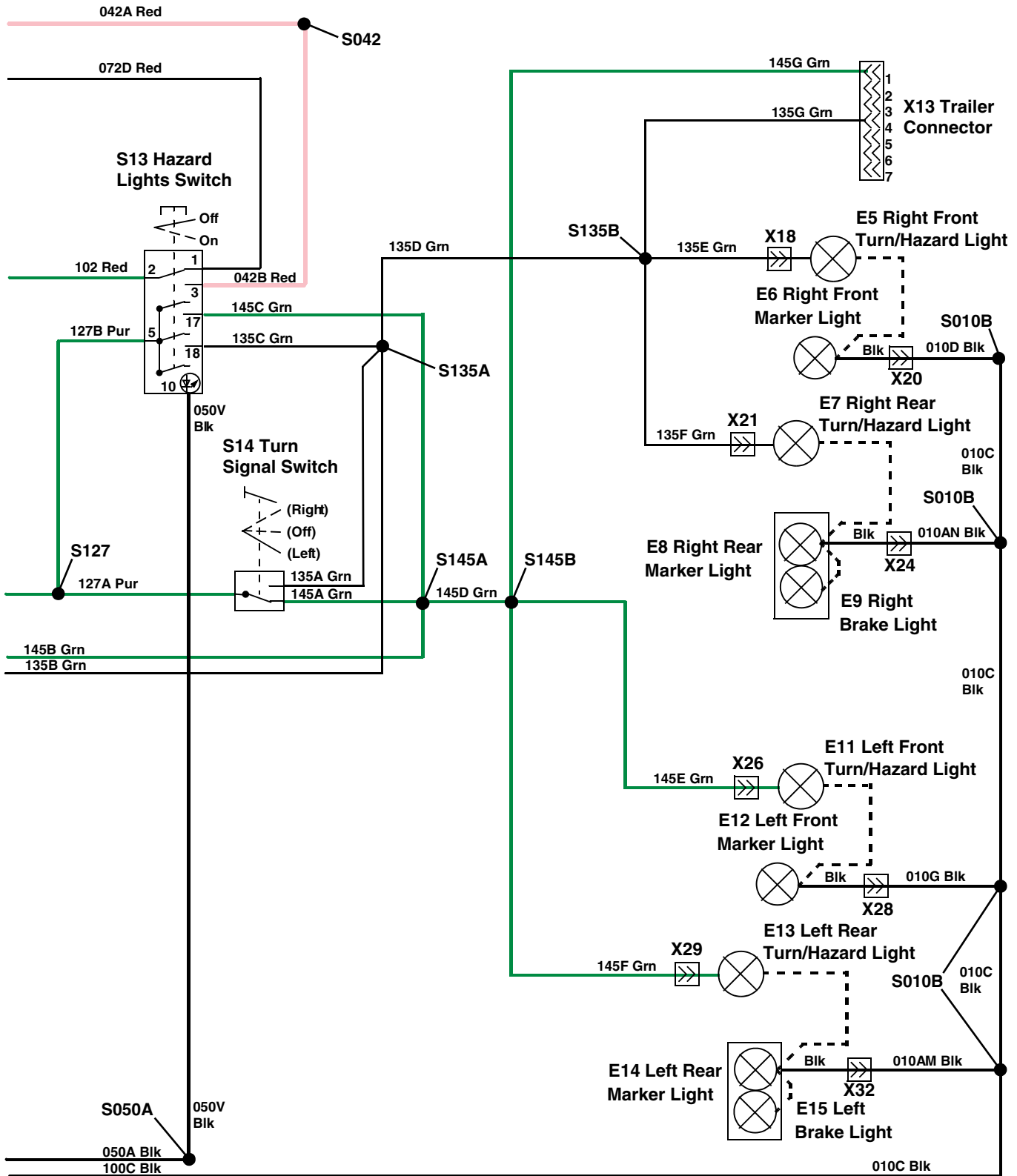
G1—Battery
K7—Flasher Relay
M1—Starting Motor
S2— Key Switch
X6— W1 Main Wiring Harness to
A1 Display Panel

X7— W1 Main Wiring Harness to
A1 Display Panel
X10— W1 Main Wiring Harness
to A1 Display Panel

X11— W1 Main Wiring Harness
to A1 Display Panel

Continued on next page

KN52281,10043D3 -19-11JAN13-2/4



LVAL38896—UN—26NOV12

Continued on next page

KN52281,10043D3 -19-11JAN13-3/4

E5— Right Front Turn/Hazard Light	E14— Left Rear Marker Light	X21— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X29— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E6— Right Front Marker Light	E15— Left Brake Light		
E7— Right Rear Turn/Hazard Light	S13— Hazard Lights Switch	X24— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X32— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness
E8— Right Rear Marker Light	S14— Turn Signal Switch		
E9— Right Brake Light	X13— W1 Main Wiring Harness Trailer Connector	X26— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
E11— Left Front Turn/Hazard Light	X18— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness	X28— W1 Main Wiring Harness to W7 Left Rear Lights Wiring Harness	
E12— Left Front Marker Light	X20— W1 Main Wiring Harness to W8 Right Rear Lights Wiring Harness		
E13— Left Rear Turn/Hazard Light			

KN52281,10043D3 -19-11JAN13-4/4

Turn Signal Lights Circuit Diagnosis

Test Procedure A

Test Conditions:

- Key switch in run position, engine off.
- Light switch in off position.
- Turn signal switch in right position.

KN52281,10043A8 -19-11JAN13-1/14

Right Turn Signal Lights Circuit

KN52281,10043A8 -19-11JAN13-2/14

Step 1

Are the front and rear right amber lights flashing? Are the right turn signal, and bulb integrity indicator lights flashing?

YES: Right turn signal light circuit is functional.

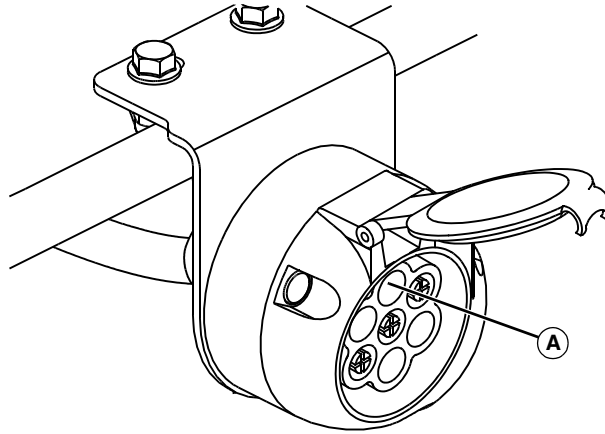
NO: To MY07: Test the bulb(s) for the light(s) not flashing. Check the 125A, 125E and 125F Grn wires and connections. Test the turn signal switch. Go to next step.

NO: From MY08-MY13: Test the bulb(s) for the light(s) not flashing. Check the 135A, 135D, 135E and 135F Grn wires and connections. Test the turn signal switch. Go to next step.

Continued on next page

KN52281,10043A8 -19-11JAN13-3/14

Step 2



LVAL12030 —UN—17NOV10

A—X13 Trailer Connector Grn Wire

Is intermittent voltage present at X13 trailer connector Grn (A) wire?

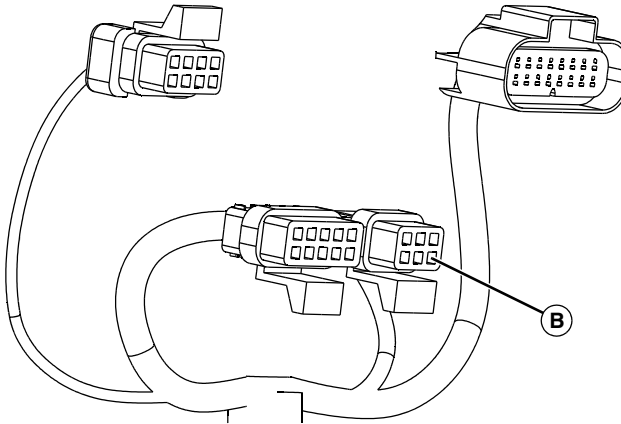
YES: Right turn signal light circuit is functional.

NO: To MY07: Check the 125A and 125D Grn wires and connections. Test the turn signal switch. Go to next step.

NO: From MY08-MY13: Check the 135A, 135D and 135G Grn wires and connections. Test the turn signal switch. Go to next step.

KN52281,10043A8 -19-11JAN13-4/14

Step 3



LVAL12031 —UN—17NOV10

B—X6 Connector Terminal D, Grn Wire

Disconnect X6 connector to the display panel. Is intermittent voltage present at terminal D, Grn (B) wire?

YES: Connect X6 connector. Right turn signal circuit is functional. If right turn indicator light does not flash, replace the display panel. Go to next step.

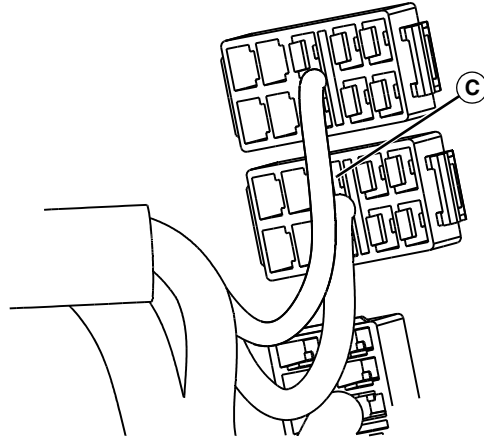
NO: To MY07: Check the 125A and 125B Grn wires and connections. Test the turn signal switch. Go to next step.

NO: From MY08-MY13: Check the 135A and 135B Grn wires and connections. Test the turn signal switch. Go to next step.

Continued on next page

KN52281,10043A8 -19-11JAN13-5/14

Step 4



LVAL12032 —UN—17NOV10

C—S14 Turn Signal Switch Connector 127A Red Wire

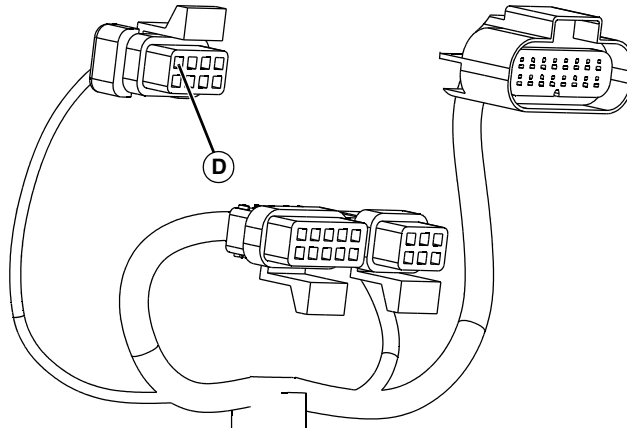
Is battery voltage present at S14 turn signal switch connector 127A Red wire (C)?

YES: Go to next step.

NO: Check the 127C and 127A Pur wires. Test hazard lights switch. If ok, replace flasher relay.

KN52281,10043A8 -19-11JAN13-6/14

Step 5



LVAL12033 —UN—17NOV10

D—X11 Connector Terminal E, 148 Gry Wire

Disconnect X11 connector to the display panel. Is intermittent voltage present at terminal E, 148 Gry wire (D)?

YES: Connect X11 connector. Flasher indicator light circuit is functional. If bulb integrity indicator light does not flash, replace the display panel. Go to next step.

NO: Check the 148 Gry wire and connections. If ok, replace the flasher relay. Go to next step.

KN52281,10043A8 -19-11JAN13-7/14

Test Procedure B

Test Conditions:

- Key switch in run position, engine off.

- Light switch in off position.
- Turn signal switch in left position.

Continued on next page

KN52281,10043A8 -19-11JAN13-8/14

Left Turn Signal Lights Circuit

KN52281,10043A8 -19-11JAN13-9/14

Step 1

Are the front and rear left amber lights flashing? Are the left turn signal, and bulb integrity indicator lights flashing?

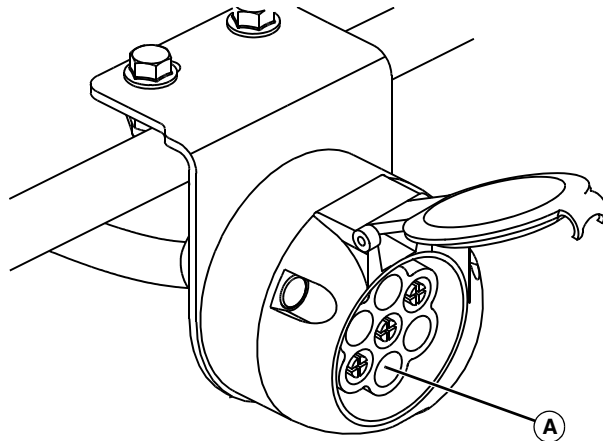
YES: Left turn signal light circuit is functional.

NO: To MY07: Test the bulb(s) for the light(s) not flashing. Check the 115A, 115E and 115F Grn wires and connections. Test the turn signal switch. Go to next step.

NO: From MY08-MY13: Test the bulb(s) for the light(s) not flashing. Check the 145A, 145D, 145E and 145F Grn wires and connections. Test the turn signal switch. Go to next step.

KN52281,10043A8 -19-11JAN13-10/14

Step 2



LVAL12034 —UN—17NOV10

A—X13 Trailer Connector Grn Wire

Is intermittent voltage present at X13 trailer connector Grn (A) wire?

YES: Left turn signal light circuit is functional.

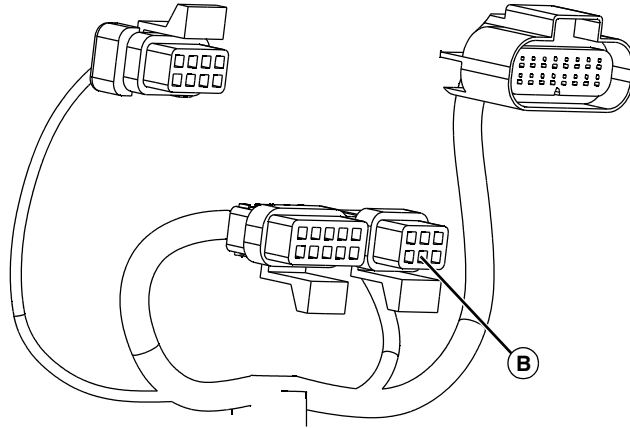
NO: To MY07: Check the 115A and 115D Grn wires and connections. Test the turn signal switch. Go to next step.

NO: From MY08-MY13: Check the 145A, 145D and 145G Grn wires and connections. Test the turn signal switch. Go to next step.

Continued on next page

KN52281,10043A8 -19-11JAN13-11/14

Step 3



LVAL12035 —UN—17NOV10

B—X6 Connector Terminal E, Grn Wire

Disconnect X6 connector to the display panel. Is intermittent voltage present at terminal E, Grn (B) wire?

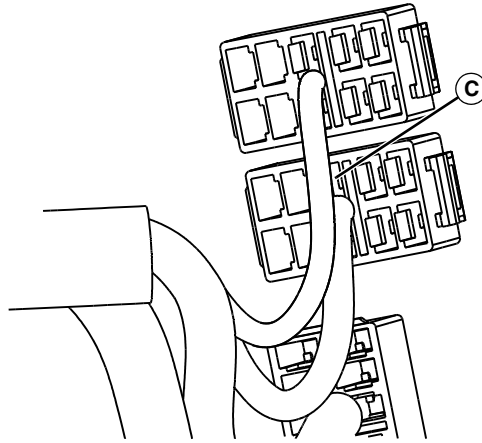
YES: Connect X6 connector. Left turn signal circuit is functional. If left turn indicator light does not flash, replace the display panel. Go to next step.

NO: To MY07: Check the 115A and 115B Grn wires and connections. Test the turn signal switch. Go to next step.

NO: From MY08-MY13: Check the 145A and 145B Grn wires and connections. Test the turn signal switch. Go to next step.

KN52281,10043A8 -19-11JAN13-12/14

Step 4



LVAL12036 —UN—17NOV10

C—S14 Turn Signal Switch Connector 127A Red Wire

Is battery voltage present at S14 turn signal switch connector 127A Pur wire (C)?

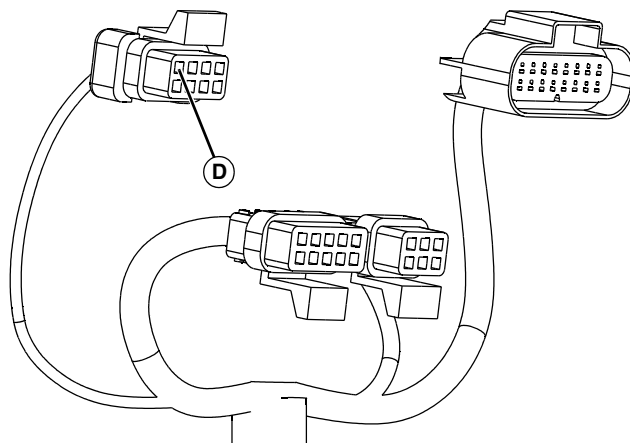
YES: Go to next step.

NO: Check the 127C and 127A Pur wires. Test hazard lights switch. If ok, replace flasher relay.

Continued on next page

KN52281,10043A8 -19-11JAN13-13/14

Step 5



LVAL12037 —UN—17NOV10

D—X11 Connector Terminal E, 148 Gry Wire

Disconnect X11 connector to the display panel. Is intermittent voltage present at terminal E, 148 Gry wire (D)?

YES: Connect X11 connector. Flasher indicator light circuit is functional. If bulb integrity indicator light does not flash, replace the display panel. Go to next step.

NO: Check the 148 Gry wire and connections. If ok, replace the flasher relay. Go to next step.

KN52281,10043A8 -19-11JAN13-14/14

Display Panel Operation

Model Year 2007 Serial Number Breaks

Model	Transmission	Serial Number
3320	eHydro™	-435000
3320	PRT	-440000
3520	eHydro™	-470000
3520	PRT	-475000

Model Year 2008 Serial Number Breaks

Model	Transmission	Serial Number
3320	eHydro™	435001-
3320	PRT	440001-
3520	eHydro™	470001-
3520	PRT	475001-
3720	eHydro™	492001-

Function:

To display operational information to the operator as to various circuit conditions. Example: turn signal on, PTO on, fuel level, or diagnostic fault codes.

To perform logic safety interlock to control safe starting, operation and shutoff of the machine engine.

Operating Conditions:

- Key switch in run or start position

Theory of Operation:

The display panel is an electronic circuit board which performs various logic functions based upon input and output signals as well as being a display for the various instruments and indicator lights.

The only functions that do not provide and input to, or receive and output from the display panel are the headlights, tail lights, work lights, fuel pump. All other electrical functions connect to the display panel for some part of their operation.

The display panel receives unswitched voltage at the X10 connector terminal D, 122E Red wire, and H, 122D Red wire, and switched voltage at terminal A, 562 Red. This provides the voltage to power up and operate the display panel.

The display panel has a permanent ground circuit through the X7 and X11 connector 050 Blk wires. The 050 Blk wires splice the 050A Blk wire to frame ground.

The display panel operates with an IF—THEN logic where combinations of voltage inputs (IF's) to the display panel produce combinations of output voltages and/or ground path(s) (THEN's).

Example:

IF voltage is provided to the display panel by the key switch being in the run position, and IF the operator is on the seat;

or,

IF voltage is provided to the display panel by the key switch being in the run position, and IF the operator is off the seat, and IF the park brake is locked, and IF the transmission is in neutral (PRT);

THEN voltage is supplied to the fuel shutoff solenoid relay and fuel shutoff solenoid hold-in coil providing the requirements to keep the machine engine running.

The fuel shutoff solenoid is held in the energized state by voltage provided from the display panel. The fuel relay is initially energized, closing its contacts and providing voltage to the fuel shutoff solenoid pull-in coil. After a short delay, the display panel energizes the fuel shutoff solenoid hold-in coil circuit.

The display panel contains a 0.5 second delay timer, controlling the voltage to the fuel relay. The timer is activated if the operator rises off the seat. 0.5 seconds after the operator leaves the seat, voltage to the fuel solenoid will stop, de-energizing it, closing the fuel shutoff solenoid valve and stopping the engine.

Inputs:

The display panel has 4 connectors (X6, X7, X10 and X11) connecting wires to the display panel to provide the inputs, outputs, and ground.

NOTE: The results listed for each input and output are based upon the operating conditions for that circuit being met. See the individual circuit operation for specific diagnostic procedures.

X6 Connector:

NOTE: When 2 wire numbers are given for a terminal, the first number is for machines up to model year 2007 and the second is for machines from model year 2008. example: X6 terminal A (334 Yel / 334A Yel).

- X6 terminal A (334 Yel / 334A Yel)—voltage in from the alternator (alternator running) will turn the battery indicator light off.
- X6 terminal B (not used)
- X6 terminal C (385A Grn / 383C Org)—voltage in from the aid position of the key switch and manifold heater circuit will turn the engine preheat light on.
- X6 terminal D (125B Grn / 135B Grn)—voltage in from the turn signal switch (right turn) will turn the right turn indicator light on.
- X6 terminal E (115B Grn / 145B Grn)—voltage in from the turn signal switch (left turn) will turn the left turn indicator light on.
- X6 terminal F (777 Pur / 777A Pur)—voltage in from the 540 PTO sensing switch will turn the 540 PTO light on when the rear PTO is engaged and the PTO selector lever is pushed rearward to the 540 rpm position.

X7 Connector:

Continued on next page

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- X7 terminal A (555 Grn / 555A Grn)—voltage in from the MFWD engagement sensing switch (MFWD engaged) will turn the MFWD indicator light on.
- X7 terminal D (572A)—voltage in from the start position of the key switch (cranking circuit) will start the logic to provide an output to the start relay if operating conditions are met.
- X7 terminal G (908 Gry)—voltage in from the display mode switch. (See [Display Mode Switch Circuit Operation](#) in Section 50, Group 35.)
- X7 terminal K (573 Org)—voltage in from the rear PTO switch (PTO off) will provide input to fuel, starting, and off seat logic as well as illuminate the rear PTO indicator light when voltage is removed.
- X7 terminal L (539A Wht)—voltage in from the seat switch (operator on seat) will provide input to fuel, starting and off seat logic.
- X7 terminal M (103 Org / 103C Org)—voltage in from the headlight switch (hazard position) will turn the right and left turn indicator lights on and start the logic to provide an output to the right and left hazard lights circuit.

X10 Connector:

- X10 terminal A (562C Red / 562H Red)—voltage in from the switched power circuit (key switch in run position) turns on the display panel.
- X10 terminal B (519 Wht)—voltage in from the transmission neutral switch (transmission in neutral) (eHydro™ uses a jumper in place of the transmission neutral switch) will provide input to fuel, starting and off seat logic.
- X10 terminal C (353 Org / 353A Org)—resistance in (approximately 8 ohms full to 89 ohms empty) from the fuel level sensor will complete the circuit for the fuel gauge to indicate the approximate fuel level within the fuel tank. This will also cause display panel logic to display a low fuel message on the LCD display when the fuel level is near empty (approximately 90 ohms or greater).
- X10 terminal D (122E Red)—voltage in from the battery for one of two operating power supplies.
- X10 terminal E (359 Wht / 359A Wht)—resistance in (approximately 22 ohms full hot to 520 ohms full cold) from the engine coolant temperature sensor will complete the circuit for the coolant temperature gauge to indicate the approximate engine coolant temperature.
- X10 terminal F (325B Grn)—frequency in from the alternator (alternator running) will provide input to the tachometer and hour meter as well as the fuel, starting, and off seat logic.
- X10 terminal G (351 Brn / 351A Brn)—voltage in from the air filter restriction switch (filter clogged) will turn the intake air restriction indicator light on.
- X10 terminal H (122F Red / 122D Red)—voltage in from the battery for one of two operating power supplies.
- X10 terminal J (347 Pur / 347A Pur)—ground in from the engine oil pressure switch (oil pressure less than 40 kPa (5.8 psi)) will turn the engine oil pressure indicator light on.
- X10 terminal K (586 Blu / 586A Blu)—voltage in from the park brake switch (park brake locked) will provide

input to fuel, starting, and off seat logic as well as illuminate the park brake indicator light.

X11 Connector:

- X11 terminal A (733 Org)—voltage in from the front PTO switch (PTO on) will provide input to fuel, starting, and off seat logic as well as illuminate the front PTO indicator light when voltage is present.
- X11 terminal D (594 Yel / 594A Yel)—voltage in from the switched power circuit (key switch in run position). If the mid PTO is installed, this input is also controlled through the mid PTO switch (PTO off) will provide input to fuel, starting, and off seat logic as well as illuminate the mid PTO indicator light when voltage is removed.
- X11 terminal E (148 Gry)—voltage in from the flasher relay will turn the bulb integrity indicator light on.
- X11 terminal F (146 Blu)—voltage in from the flasher relay will turn the trailer 1 indicator light on.
- X11 terminal G (144 Yel)—voltage in from the flasher relay will turn the trailer 2 indicator light on.

Outputs:

NOTE: The outputs are also monitored by the display panel circuit logic to check circuit operation. If the circuit is not operating properly, the display panel will display a fault code on the LCD display. (See [Display Panel Fault Code Chart](#) in Section 50, Group 30.)

X7 Connector:

- X7 terminal N (304 Yel / 304A Yel)—voltage out to the fuel relay coil when operating conditions are met.
- X7 terminal B (302 Red)—voltage out to the fuel shutoff solenoid hold-in coil when conditions are met.
- X7 terminal C (518 Gry / 518A Gry)—voltage out to the start relay coil when operating conditions are met.
- X7 terminal H (143 Org / not used)—voltage out to the right turn signal light, either pulsing or constant based on inputs.
- X7 terminal J (133 Org / not used)—voltage out to the left turn signal light, either pulsing or constant based on inputs.

Ground:

X7 Connector:

- X7 terminal P (050G Blk / 050E Blk)—provides one of two permanent ground circuits for the display panel.

X11 Connector:

- X11 terminal H (050D Blk)—provides one of two permanent ground circuits for the display panel.

eHydro™ Communication:

X7 Connector:

- X7 terminal R (924 Yel / 924A Yel)—provides input communication to the display panel from the electronic drive controller.

Continued on next page

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- X7 terminal S (925 Grn / 925A Grn)—provides output communication from the display panel to the electronic drive controller.

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Display Panel Operation—MY13

Function

To display operational information to the operator as to various circuit conditions. Example: turn signal on, PTO on, fuel level, or diagnostic fault codes.

To perform logic safety interlock to control safe starting, operation and shutoff of the machine engine.

Operating Conditions

- Key switch in run or start position.

Theory of Operation

The display panel is an electronic circuit board which performs various logic functions based upon input and output signals as well as being a display for the various instruments and indicator lights.

The only functions that do not provide an input to, or receive an output from the display panel are the headlights, tail lights, work lights, fuel pump. All other electrical functions connect to the display panel for some part of their operation.

The display panel receives unswitched voltage at the X10 connector terminal D, 122E Red wire, and H, 122D Red wire, and switched voltage at terminal A, 562A Red. This provides the voltage to power up and operate the display panel.

The display panel has a permanent ground circuit through the X7 and X11 connector 050 Blk wires. The 050 Blk wires splice the 050A Blk wire to frame ground.

The display panel operates with an IF—THEN logic where combinations of voltage inputs (IF's) to the display panel produce combinations of output voltages and/or ground path(s) (THEN's).

Example:

IF voltage is provided to the display panel by the key switch being in the run position, and IF the operator is on the seat;

or,

IF voltage is provided to the display panel by the key switch being in the run position, and IF the operator is off the seat, and IF the park brake is locked, and IF the transmission is in neutral (PRT);

THEN voltage is supplied to the fuel shutoff solenoid relay and fuel shutoff solenoid hold-in coil providing the requirements to keep the machine engine running.

The fuel shutoff solenoid is held in the energized state by voltage provided from the display panel. The fuel relay is initially energized, closing its contacts and providing voltage to the fuel shutoff solenoid pull-in coil. After a short delay, the display panel energizes the fuel shutoff solenoid hold-in coil circuit.

The display panel contains a 0.5 second delay timer, controlling the voltage to the fuel relay. The timer is

activated if the operator rises off the seat. 0.5 seconds after the operator leaves the seat, voltage to the fuel solenoid will stop, de-energizing it, closing the fuel shutoff solenoid valve and stopping the engine.

Inputs

The display panel has 4 connectors (X6, X7, X10 and X11) connecting wires to the display panel to provide the inputs, outputs, and ground.

NOTE: The results listed for each input and output are based upon the operating conditions for that circuit being met. See the individual circuit operation for specific diagnostic procedures.

X6 Connector

- X6 terminal A (334A Yel)—voltage in from the alternator (alternator running) will turn the battery indicator light off.
- X6 terminal B (573 Org)—voltage in from the rear PTO switch (PTO off) will provide input to fuel, starting, and off seat logic as well as illuminate the rear PTO indicator light when voltage is removed.
- X6 terminal C (383C Org)—voltage in from the aid position of the key switch and manifold heater circuit will turn the engine preheat light on.
- X6 terminal D (135B Grn)—voltage in from the turn signal switch (right turn) will turn the right turn indicator light on.
- X6 terminal E (145B Grn)—voltage in from the turn signal switch (left turn) will turn the left turn indicator light on.
- X6 terminal F (777A Pur)—voltage in from the 540 PTO sensing switch will turn the 540 PTO light on when the rear PTO is engaged and the PTO selector lever is pushed rearward to the 540 rpm position.

X7 Connector

- X7 terminal A (555A Grn)—voltage in from the MFWD engagement sensing switch (MFWD engaged) will turn the MFWD indicator light on.
- X7 terminal D (572A)—voltage in from the start position of the key switch (cranking circuit) will start the logic to provide an output to the start relay if operating conditions are met.
- X7 terminal G (908 Gry)—voltage in from the display mode switch. (See [Display Mode Switch Circuit Operation](#) in Section 50, Group 35.)
- X7 terminal K (574A)
- X7 terminal L (539A Wht)—voltage in from the seat switch (operator on seat) will provide input to fuel, starting and off seat logic.
- X7 terminal M (103 Org / 103C Org)—voltage in from the headlight switch (hazard position) will turn the right and left turn indicator lights on and start the logic to provide an output to the right and left hazard lights circuit.

X10 Connector

- X10 terminal A (562C Red / 562H Red)—voltage in from the switched power circuit (key switch in run position) turns on the display panel.

Continued on next page

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- X10 terminal B (519 Wht)—voltage in from the transmission neutral switch (transmission in neutral) (eHydro™ uses a jumper in place of the transmission neutral switch) will provide input to fuel, starting and off seat logic.
- X10 terminal C (353 Org / 353A Org)—resistance in (approximately 8 ohms full to 89 ohms empty) from the fuel level sensor will complete the circuit for the fuel gauge to indicate the approximate fuel level within the fuel tank. This will also cause display panel logic to display a low fuel message on the LCD display when the fuel level is near empty (approximately 90 ohms or greater).
- X10 terminal D (122E Red)—voltage in from the battery for one of two operating power supplies.
- X10 terminal E (359A Wht)—resistance in (approximately 22 ohms hot to 520 ohms cold) from the engine coolant temperature sensor will complete the circuit for the coolant temperature gauge to indicate the approximate engine coolant temperature.
- X10 terminal F (565A Grn)
- X10 terminal G (351A Brn)—voltage in from the air filter restriction switch (filter clogged) will turn the intake air restriction indicator light on.
- X10 terminal H (122D Red)—voltage in from the battery for one of two operating power supplies.
- X10 terminal J (347A Pur)—ground in from the engine oil pressure switch (oil pressure less than 40 kPa (5.8 psi)) will turn the engine oil pressure indicator light on.
- X10 terminal K (586A Blu)—voltage in from the park brake switch (park brake locked) will provide input to fuel, starting, and off seat logic as well as illuminate the park brake indicator light.

X11 Connector

- X11 terminal A (733 Org)—voltage in from the front PTO switch (PTO on) will provide input to fuel, starting, and off seat logic as well as illuminate the front PTO indicator light when voltage is present.
- X11 terminal D (594A Yel)—voltage in from the switched power circuit (key switch in run position). If the mid PTO is installed, this input is also controlled through the mid PTO switch (PTO off) will provide input to fuel, starting, and off seat logic as well as illuminate the mid PTO indicator light when voltage is removed.
- X11 terminal E (148 Gry)—voltage in from the flasher relay will turn the bulb integrity indicator light on.

- X11 terminal F (146 Blu)—voltage in from the flasher relay will turn the trailer 1 indicator light on.
- X11 terminal G (144 Yel)—voltage in from the flasher relay will turn the trailer 2 indicator light on.

Outputs

NOTE: The outputs are also monitored by the display panel circuit logic to check circuit operation. If the circuit is not operating properly, the display panel will display a fault code on the LCD display. (See [Display Panel Fault Code Chart](#).)

X7 Connector

- X7 terminal N (304A Yel)—voltage out to the fuel relay coil when operating conditions are met.
- X7 terminal B (302 Red)—voltage out to the fuel shutoff solenoid hold-in coil when conditions are met.
- X7 terminal C (518A Gry)—voltage out to the start relay coil when operating conditions are met.
- X7 terminal H (not used)—voltage out to the right turn signal light, either pulsing or constant based on inputs.
- X7 terminal J (not used)—voltage out to the left turn signal light, either pulsing or constant based on inputs.

Ground

X7 Connector

- X7 terminal P (050E Blk)—provides one of two permanent ground circuits for the display panel.

X11 Connector

- X11 terminal H (050D Blk)—provides one of two permanent ground circuits for the display panel.

eHydro™ Communication

X7 Connector

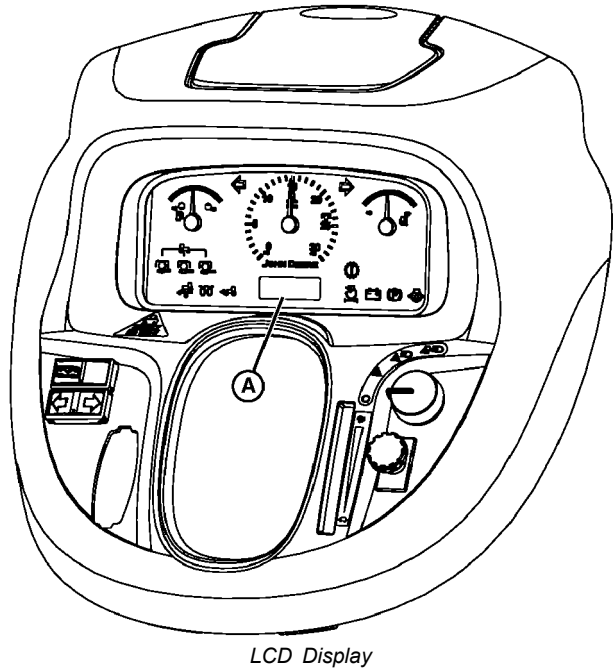
- X7 terminal R (924A Yel)—provides input communication to the display panel from the electronic drive controller.
- X7 terminal S (925A Grn)—provides output communication from the display panel to the electronic drive controller.

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Display Panel LCD Message

- Specific messages are displayed on the liquid crystal display (LCD) for machine operation.

A—LCD Display



LCD Display

KN52281,10043AA -19-23OCT12-1/2

LV15729 —UN—04MAY12

- Instrument Panel LCD Display Messages

LoFUEL = Low Fuel

tEnPHI = Hi Coolant Temperature

nE'Ut oF = Neutral Safety Switch Off

PtOO n = PTO On

FPtO = Front PTO On

EnGrUn = Engine Running

LCD Display Messages

Representation of the Message Displayed	Description of the Message
LoFUEL	The fuel gauge needle has gone into the red zone. Appears only once during the power cycle.
tEnPHI	The coolant temperature needle has gone into the red zone. Appears only once during the power cycle.
nEUtoF	Gear Tractors - The operator is out of the seat and the transmission is in gear. HST Tractors - The neutral wire jumper cap located under the left foot deck has been removed or is loose.
PtOOn	The operator is not in the seat, the park brake was not set, and the PTO switch is on.
FPtO	The operator is not in the seat and the front PTO switch is on. (EEC only)
EnGrUn	The engine is already running and there is an attempt to start the engine.

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LV15710 —UN—04MAY12

Display Panel Diagnosis

See the individual circuit operation for specific diagnostic procedures.

KN52281,10043AB -19-23OCT12-1/1

Display Mode Switch Circuit Operation

Function:

To roll the LCD display between displaying hour, travel speed and switch settings.

This switch is also used to enter the configuration mode of the display panel to configure the display to the machine and options installed.

Operating Conditions:

- Key switch in run or start position

Theory of Operation:

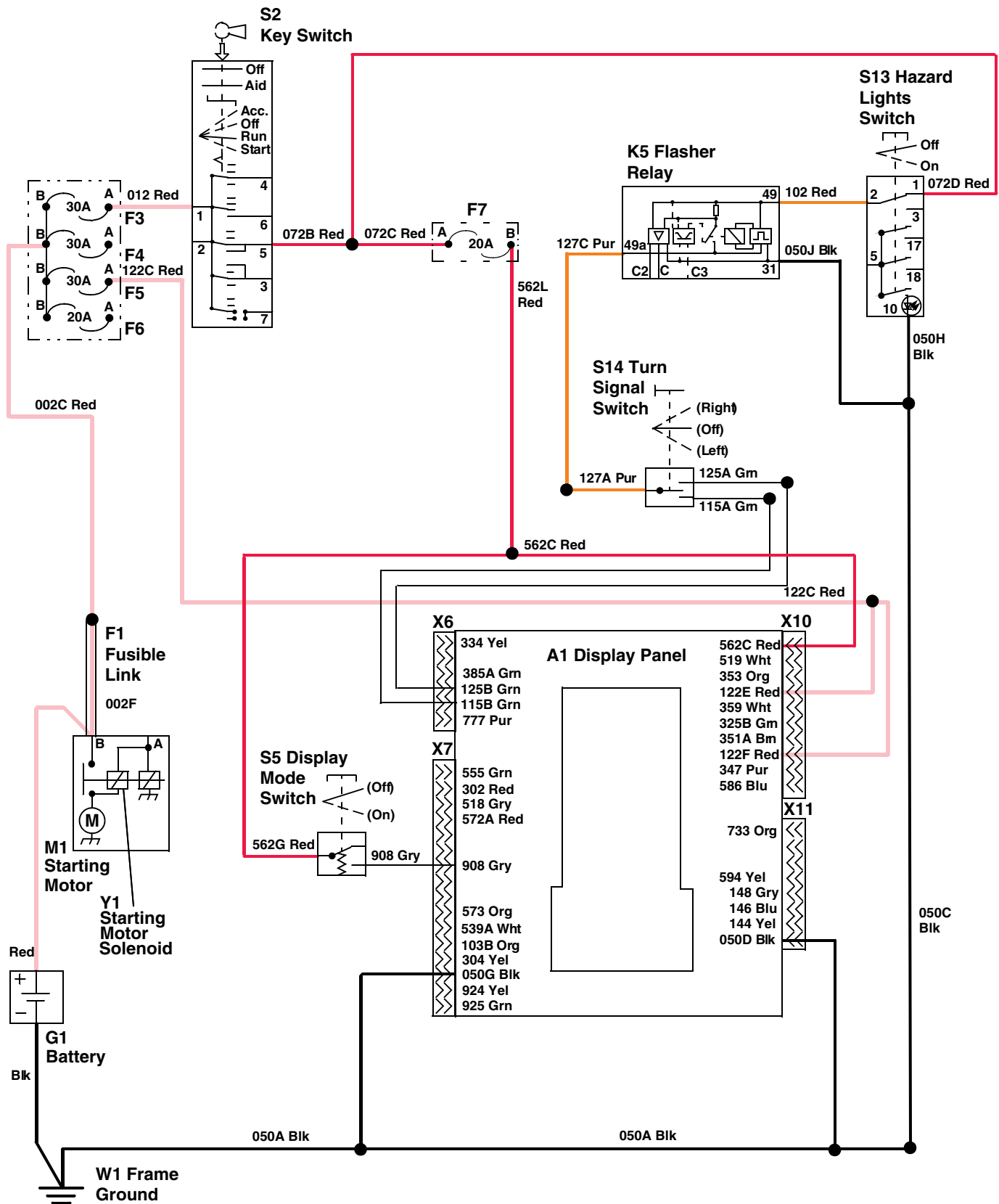
The display mode switch is a momentary contact switched used to change the display message in the LCD and to change the configuration setting of the display panel.

The turn signal switch is also used to enter setup information when the display mode switch is held in the on position. (See Configure the Display in Section 40, Group 45.)

Switched power is supplied from the key switch, 072B and 072C Red wires, F7 fuse and 562 red wires to the display mode switch. When the display mode switch is pressed, power is supplied to the 908 Gry wire and the display panel through the X7 connector at terminal G.

KN52281,10043AC -19-23OCT12-1/1

Display Mode Switch Circuit Electrical Schematic Pre MY08



LVAL12038 —UN—17NOV10

Continued on next page

KN52281,10043AD -19-07DEC12-1/2

A1—Display Panel
F1—Fusible Link
F3—Fuse 30A
F4—Fuse 30A
F5—Fuse 30A
F6—Fuse 20A
F7—Fuse 20A
G1—Battery
K5—Flasher Relay

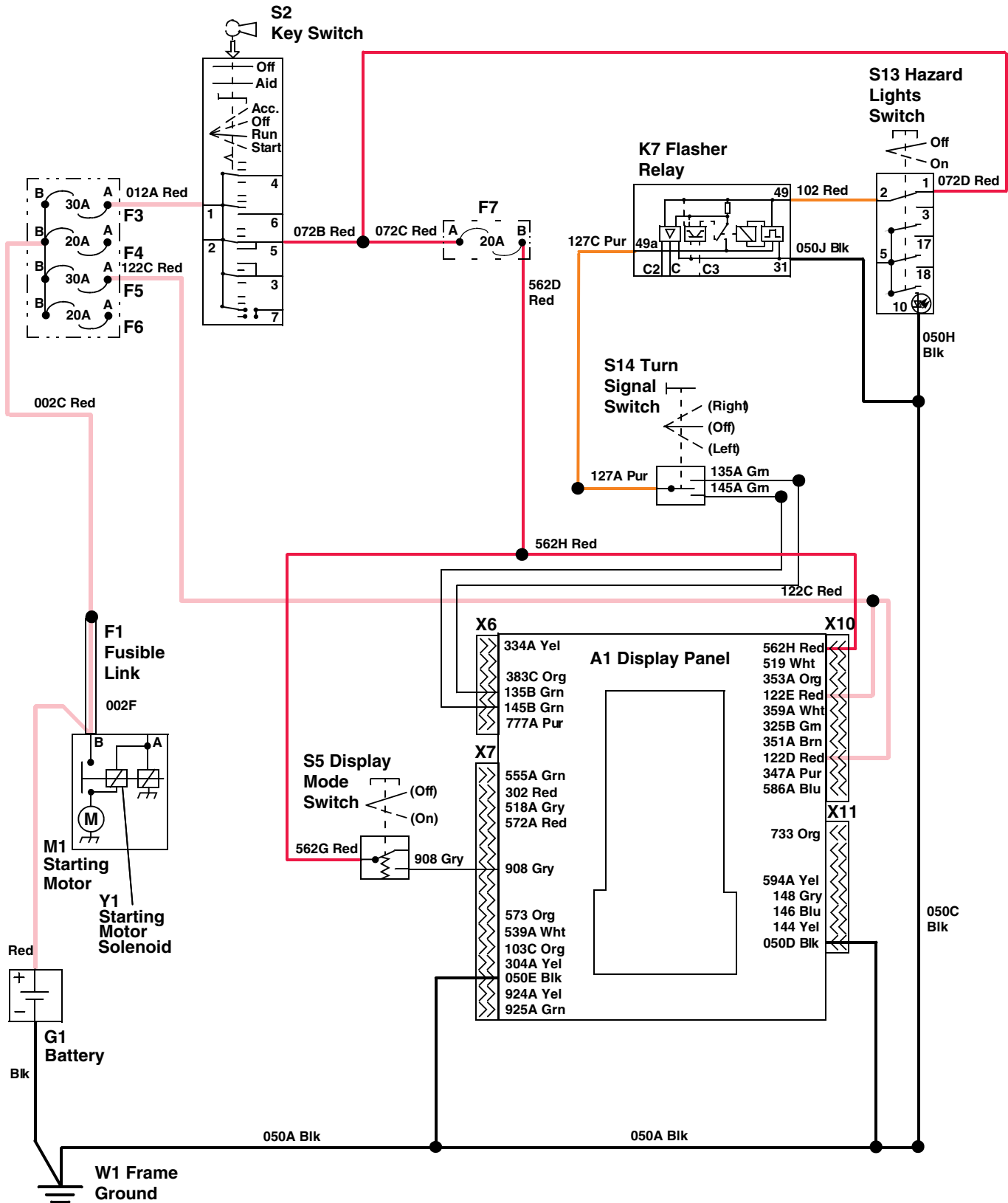
M1—Starting Motor
S2—Key Switch
S5—Display Mode Switch
S13—Hazard Lights Switch
S14—Turn Signal Switch
W1—Frame Ground

X6—W1 Main Wiring Harness to
A1 Display Panel
X7—W1 Main Wiring Harness to
A1 Display Panel
X10—W1 Main Wiring Harness
to A1 Display Panel

X11—W1 Main Wiring Harness
to A1 Display Panel
Y1—Starting Motor Solenoid

KN52281,10043AD -19-07DEC12-2/2

Display Mode Switch Circuit Electrical Schematic—MY08



LVAL12039 —UN—17NOV10

Continued on next page

KN52281,10043AE -19-23OCT12-1/2

A1—Display Panel
F1—Fusible Link
F3—Fuse 30A
F4—Fuse 30A
F5—Fuse 30A
F6—Fuse 20A
F7—Fuse 20A
G1—Battery
K7—Flasher Relay

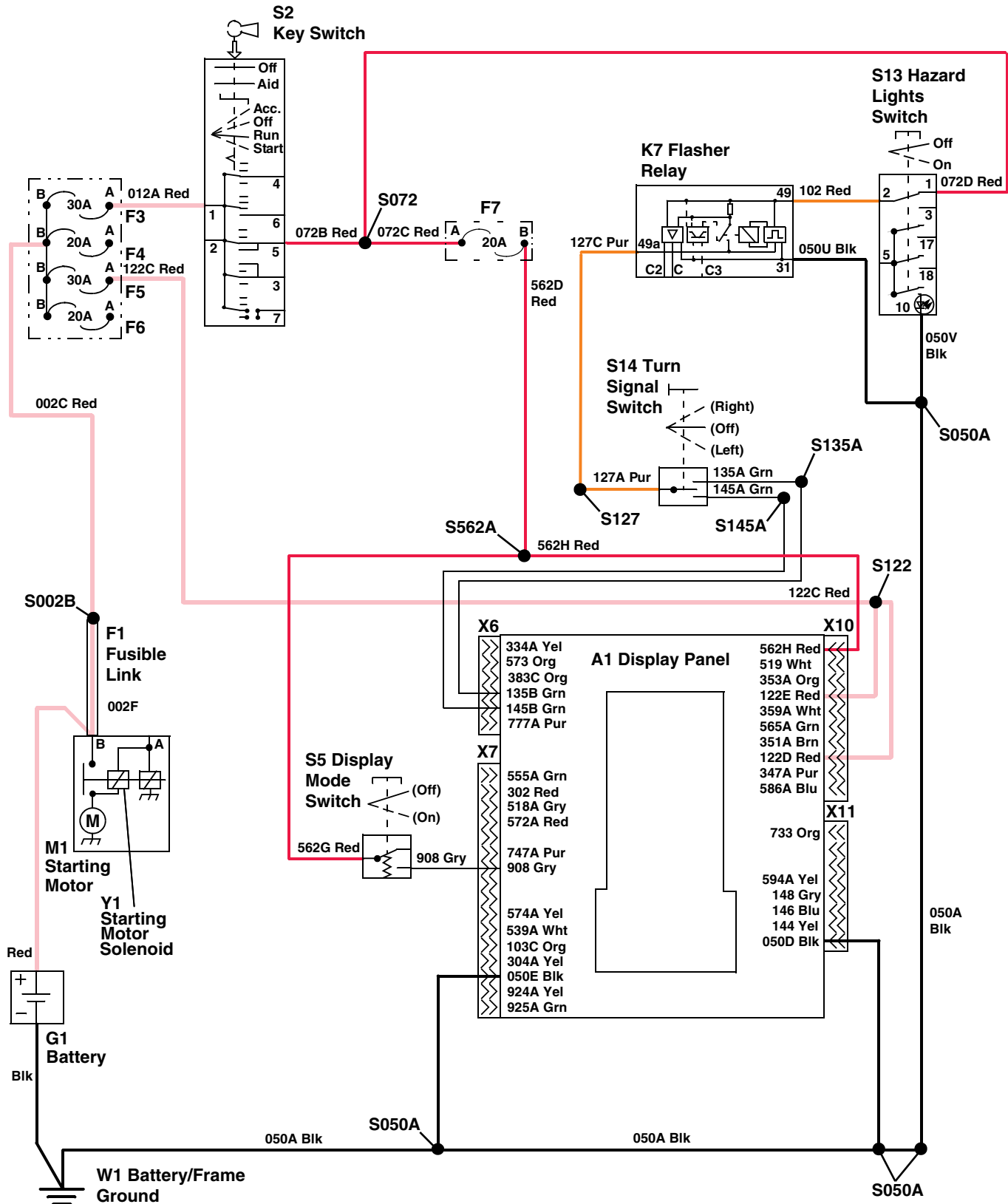
M1—Starting Motor
S2—Key Switch
S5—Display Mode Switch
S13—Hazard Lights Switch
S14—Turn Signal Switch
W1—Frame Ground

X6—W1 Main Wiring Harness to
A1 Display Panel
X7—W1 Main Wiring Harness to
A1 Display Panel
X10—W1 Main Wiring Harness
to A1 Display Panel

X11—W1 Main Wiring Harness
to A1 Display Panel
Y1—Starting Motor Solenoid

KN52281,10043AE -19-23OCT12-2/2

Display Mode Switch Circuit Electrical Schematic—MY13



LVAL38897 —UN—15JAN13

Continued on next page

KN52281,10043D4 -19-10JAN13-1/2

A1—Display Panel
F1—Fusible Link
F3—Fuse 30A
F4—Fuse 20A
F5—Fuse 30A
F6—Fuse 20A
F7—Fuse 20A
G1—Battery
K7—Flasher Relay

M1—Starting Motor
S2—Key Switch
S5—Display Mode Switch
S13—Hazard Lights Switch
S14—Turn Signal Switch
W1—Battery/Frame Ground

X6—W1 Main Wiring Harness to A1 Display Panel
X7—W1 Main Wiring Harness to A1 Display Panel
X10—W1 Main Wiring Harness to A1 Display Panel

X11—W1 Main Wiring Harness to A1 Display Panel
Y1—Starting Motor Solenoid

KN52281,10043D4 -19-10JAN13-2/2

Display Mode Switch Circuit Diagnosis

Test Procedure A

Test Conditions:

- Park brake locked.

- Key switch in run position, engine not running.
- Turn signal light circuit functional, (See [Turn Signal Lights Circuit Diagnosis](#) in Section 50, Group 35.)
- Display mode switch pressed for each test.

KN52281,10043AF -19-23OCT12-1/5

Display Mode Circuit

KN52281,10043AF -19-23OCT12-2/5

Step 1

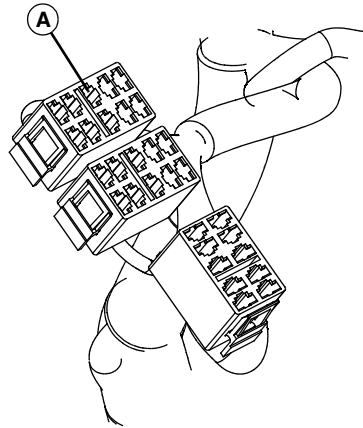
Does the LCD display change display information each time the display mode switch is pressed and released?

YES: Circuit and display panel are functional.

NO: Go to next step.

KN52281,10043AF -19-23OCT12-3/5

Step 2



LVAL12040 —UN—17NOV10

A—S5 Display Mode Switch Connector, 562G Red Wire

Disconnect the display mode switch. Is battery voltage present at S5 display mode switch connector 562G Red wire (A)?

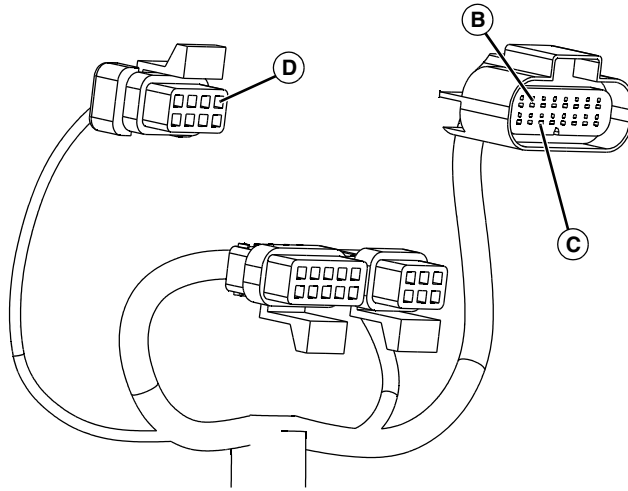
YES: Connect display mode switch. Go to next step.

NO: Check the F7 fuse. Check the 562 Red wires and connections. Test unswitched power circuit. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

Continued on next page

KN52281,10043AF -19-23OCT12-4/5

Step 3



LVAL12041 —UN—17NOV10

B—X7 Connector Terminal G, 908 Gry Wire
C—X7 Connector, 050 Blk Ground Wire
D—X7 Connector, 050 Blk Ground Wire

Disconnect X7 connector to the display panel. Is battery voltage present at terminal G, 908 Gry wire (B) when display mode switch is pressed?

YES: Connect X7 connector. Check 050 Blk ground wires (C) and (D). Check power into the display panel. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.) If ground and power are ok, replace display panel.

NO: Check 908 Gry wire and connections. Test display mode switch.

KN52281,10043AF -19-23OCT12-5/5

eHydro™—eMatchOS Electronic Drive Controller

Function:

The purpose of the drive controller is to control both the drive direction and speed of the machine. Additionally the drive controller provides for setting a maximum travel speed, cruise control, pedal aggressiveness, and load match to prevent stalling the engine during operation.

Each of these additional functions has the ability to be turned on or off by the operator.

General Theory:

The drive controller is a preprogrammed electrical device that allows the operator to control the machine drive direction and speed via the electrical inputs from the forward and reverse foot pedals. Under normal operating conditions, this creates an output to the corresponding directional control valve coil in the transmission.

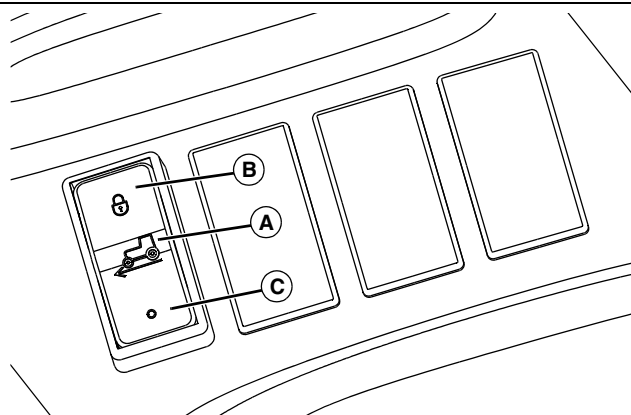
The output current to the directional valve coil is proportional to the pedal position. The forward and reverse pedals have an adjustable proportional setting (motion match). This setting allows for greater control, comfort and smoother operation around neutral. The same proportional setting affects both the forward and reverse command.

The rate of acceleration and deceleration is also controlled by the drive controller to smoothly ramp the speed up and down.

Cruise Control—Standard:

The cruise control feature allows the operator to set and hold a speed setting that the operator desires without having to press and hold the forward pedal.

The cruise control switch receives power from the switched power circuit on 552A, 552B and 552C Red wires. Placing the cruise control switch to the on (center) position (A),



LVAL12042—UN—17NOV10

A—Cruise Control Switch ON (center) Position
B—Cruise Control Switch Lock Position
C—Cruise Control Switch OFF Position

supplies power from the 552C Red wire across the switch to the 238 Gry wire to the drive controller (terminal B3). This input enables the cruise control function.

Momentarily pressing the cruise control switch to the lock position (B) supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller (terminal B2). This input will set the cruise speed at the speed being traveled.

Once set, the drive controller monitors the machine speed and varies the current to the transmission forward directional solenoid to maintain travel speed at the set point.

To adjust travel speed, disengage cruise control and engage cruise control again at a different speed.

Placing the cruise control switch in the off position (C) or pressing either the right brake pedal or reverse pedal will disengage the cruise function.

Continued on next page

KN52281,10043B0 -19-23OCT12-1/5

Cruise Control—Optional:

The cruise control feature allows the operator to set and hold a speed setting that the operator desires without having to press and hold the forward pedal.

The cruise/max speed switch receives power from the switched power circuit on 552A and 552C Red wires. The Res/ +, Set/—switch receives power from the switched power circuit on 552A and 552B Red wires.

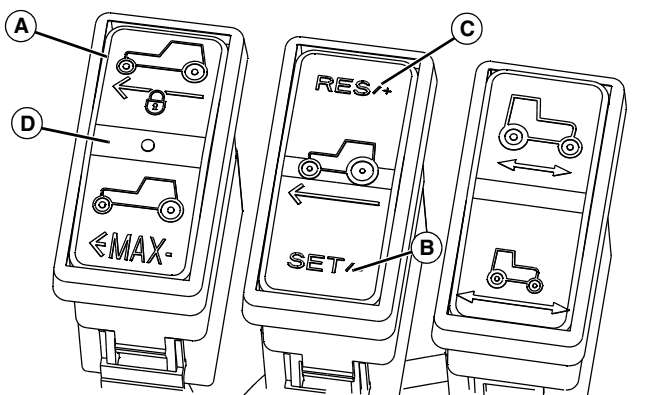
Placing the cruise/max speed switch to the cruise position, (A) supplies power from the 552C Red wire across the switch to the 238 Gry wire to the drive controller (terminal B3). This input enables the cruise control function. Once the machine is traveling at the desired speed, momentarily pressing the Res/ +, Set/—switch to the Set/- position (B) supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller (terminal B2). This input will set the cruise speed at the speed being traveled.

Once set, the drive controller monitors the machine speed and varies the current to the transmission forward directional solenoid to maintain travel speed at the set point.

The cruise speed setting can be increased and decreased while the machine is being driven by momentarily pressing either the Res/+ switch to increase the cruise speed or the Set/- switch to decrease the cruise speed setting.

Pressing the Res/+ position (C) of the switch supplies power from the 552B Red wire across the switch to the 266 Blu wire to the drive controller (terminal J2). Pressing the Set/- side (B) of the switch supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller (terminal B2).

Pressing Res/+, or Set/- positions of the switch to change the cruise speed setting will become effective immediately without returning to neutral.



A—Cruise/Max Speed Switch
Cruise Position
B—Set/- Position

C—Res/+ Position
D—Cruise/Max Speed Switch
OFF (center) Position

LVAL12043 —UN—17NOV10

The increase/decrease amount is a percentage of the actual machine speed.

Placing the cruise/max speed switch in the off (center) position (D) or pressing either the right brake pedal or reverse pedal will disengage the cruise function. The last speed setting is stored in the controller and if the operator is pressing the forward pedal, the Res/+ side (C) of the switch can be pressed to ramp back to the stored speed.

Placing the cruise/max speed switch in the off (center) position (D) removes power to the drive controller and erases the stored setting.

If changes in machine loading or range gear position settings do not allow for return to the previous speed setting, the controller will attempt to return to the speed setting by sending either the maximum (fastest speed possible) or minimum (slowest speed possible) drive current to the transmission forward directional solenoid.

Continued on next page

KN52281,10043B0 -19-23OCT12-2/5

Max Speed:

The max speed feature allows the operator to set the maximum speed the machine will travel when the drive pedal is fully depressed.

If the operator needs to return to a specific travel speed, the max speed setting will allow the machine to return to this specific speed setting while maintaining proportional acceleration and deceleration. Unlike cruise control, the max speed setting requires the operator to press and hold the drive pedal to obtain a travel function.

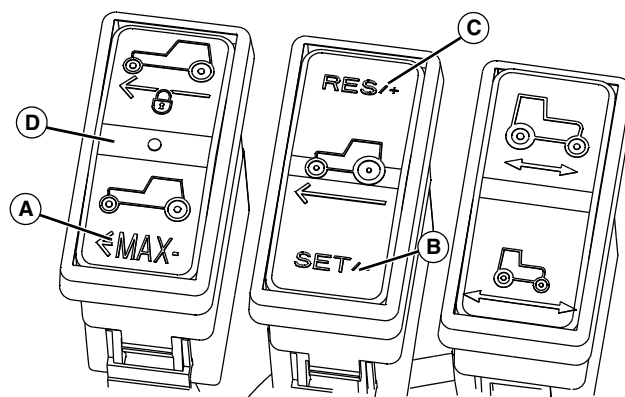
The cruise/max speed switch receives power from the switched power circuit on 552A and 552C Red wires. The Res/ +, Set/—switch receives power from the switched power circuit on 552A and 552B Red wires.

Placing the cruise/max speed switch to the max speed position (A), supplies power from the 552C Red wire across the switch to the 267 Pur wire to the drive controller (terminal A2). This input enables the max speed function. Once the machine is traveling at the desired speed, momentarily pressing the Res/ +, Set/—switch to the Set/— position (B) supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller (terminal B2). This input will set the max speed at the speed being traveled.

The maximum travel speed of the machine will then be limited to the speed the operator was traveling at as long as the max speed switch remains in the on position.

The max speed setting can be increased and decreased while the machine is being driven by momentarily pressing either the Res/+ side (C) of the switch to increase the max speed or the Set/- side (B) of the switch to decrease the max speed setting.

Pressing the Res/+ side (C) of the switch supplies power from the 552B Red wire across the switch to the 266 Blu wire to the drive controller (terminal J2). Pressing the Set/- side (B) of the switch supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller (terminal B2).



A—Cruise/Max Speed Switch
Cruise Position
B—Set/- Position

C—Res/+ Position
D—Cruise/Max Speed Switch
OFF (center) Position

Using the Res/+ side of the switch or the Set/- side of the switch to change the max speed setting will become effective immediately without returning to neutral. The increase/decrease amount is a percentage of the actual machine speed.

The max speed function is disengaged when the max speed switch is placed in the off (center) position (D). Disengagement will become effective immediately.

Once the max speed setting is set it will be stored and is available until it is replaced by another setting or if the drive controller is replaced. Placing the max speed switch in the on position (A) will enable the last maximum speed setting.

If changes in machine loading or range gear position settings do not allow for return to the previous speed setting, the controller will attempt to return to the speed setting by sending either the maximum (fastest speed possible) or minimum (slowest speed possible) drive current to the transmission forward directional solenoid.

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Motion Match Switch:

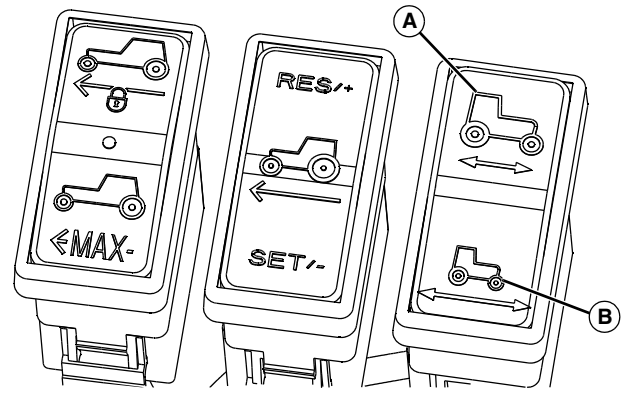
Motion Match enables the operator to adjust machine acceleration and deceleration rates.

Placing the motion match switch in the on position (A) will give the transmission higher response sensitivity to drive pedal movement. Shorter starting and stopping distances can be set for applications requiring rapid changes in direction, such as operating with a loader.

Placing the motion match switch in the off position (B) will give the drive pedals the sensitivity that is typical to most normal operating conditions. Longer starting and stopping distances can be set to avoid turf damage in other applications.

The motion match switch receives secondary switched power from the drive controller on 673A, 673E, and 673 Org wires.

When the motion match switch is in the on position (A), power is supplied from the 673 Org wire, across the



A—ON Position

B—OFF Position

motion match switch to the 269 Wht wire to the drive controller (terminal C3). This enables the motion match function for quicker acceleration and deceleration rates.

Continued on next page

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LVAL12045 —UN—17NOV10

Load Match Switch:

Load match is used to eliminate operators stalling the engine during a typical application such as loader work. A throttle position sensor is installed to read the no-load engine rpm set point.

If the engine rpm drops far enough below the set point value, the current sent to the transmission drive valve coils is reduced to allow the engine to recover. The greater the load on the engine, the greater the reduction in current.

If cruise control is active and the load match comes on, the cruise speed output is held at whatever speed it is currently operating at until load match goes back to 100%.

The load match switch can be turned on or off to allow the operator to disable the load match function if desired.

The load match feature will have no effect if the machine is not being driven when the stalling load is being placed on the engine.

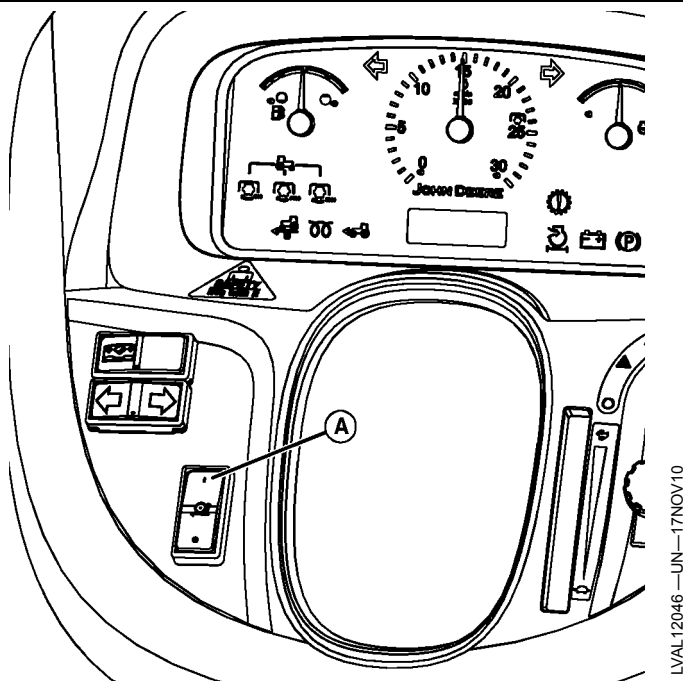
The load match switch receives power from the switched power circuit on 552 Red wires.

When the load match switch is in the on position (A), power is supplied from the 552 Red wire, across the load match switch to the 268 Gry wire to the drive controller (terminal H1). This enables the load match function to prevent the engine stalling during heavy load applications.

Drive Controller Inputs and Outputs:

Inputs:

- Terminal A1 (none / 529 Wht)—not used.
- Terminal A2 (267 Pur / 267A Pur)—voltage in from the cruise/max speed switch, max speed on position.
- Terminal A3 (552B Red / 552N Red)—voltage in from the switched power circuit (key switch in run or start position) turns on the drive controller.
- Terminal B2 (265 Grn / 265A Grn)—voltage in from the Res/ +, Set/—switch, Set/—position.
- Terminal B3 (238 Gry / 238A Gry)—voltage in from the cruise/max speed switch, cruise control on position.
- Terminal C3 (269 Wht / 269A Wht)—voltage in from the motion match switch, motion match on position.
- Terminal D2 (none / 513 Org)—not used.
- Terminal D3 (562 Red / none)—not used.
- Terminal E1 (925 Grn / 925B Grn)—provides input communication from the display panel to the drive controller.
- Terminal E3 (none / 523 Org)—not used.
- Terminal F1 (203 Org)—voltage in from the back up alarm (optional).
- Terminal F2 (686 Lt Blu)—voltage in from the forward pedal position sensor.
- Terminal F3 (325 Grn / 325D Grn)—frequency in from the alternator, used to indicate the engine is running and for cruise control, max speed, load match, and motion match operation.
- Terminal G1 (247 Pur / 247B Pur)—voltage in from the brake switch, right brake pedal depressed.



A—ON Position

- Terminal G2 (499 Wht / 499A Wht)—voltage in from the throttle position sensor.
- Terminal G3 (502 Red / 502A Red)—frequency in from the MFW speed sensor.
- Terminal H1 (268 Gry)—voltage in from the load match switch, load match on position.
- Terminal H3 (687 Pur)—voltage in from the reverse pedal position sensor.
- Terminal J1 (none / none)—not used.
- Terminal J2 (266 Blu / 266A Lt Blu)—voltage in from the Res/ +, Set/—switch, Res/ + position.
- Terminal J3 (539 Wht / 539D Wht)—voltage in from the seat switch, operator on seat.

Outputs:

- Terminal B1 (673A Org)—voltage out to the position sensors and motion match switch.
- Terminal H2 (924 Yel / 924B Yel)—provides output communication to the display panel from the drive controller.
- Terminal K2 (696 Blu / 696A Lt Blu)—voltage out to the forward proportional solenoid.
- Terminal K3 (697 Pur / 697A Pur)—voltage out to the reverse proportional solenoid.

Grounds:

- Terminal C2 (550A Blk)—ground in from the position sensors.
- Terminal E2 (050B Blk / 050H Blk)—ground circuit for drive controller. Grounds back to frame ground through the X4 connector.

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eHydro™—Forward Drive Circuit Operation

Function:

The forward drive circuit causes the electronic drive controller to propel the machine in a controlled forward direction.

Additionally the electronic drive controller provides for setting the following functions during a forward drive:

- Maximum travel speed
- Cruise control
- Motion match (pedal responsiveness)
- Load match

Each of these additional functions has the ability to be turned on or off by the operator.

Operating Conditions:

- Key switch in run position
- Engine running
- Operator on seat
- Park brake unlocked
- Forward pedal depressed

Theory of Operation:

The electronic drive controller (drive controller) is a preprogrammed electrical device that allows the operator to control the machine forward drive function and speed via the electrical inputs from the forward foot pedal. Under normal operating conditions, this creates an output to the forward proportional solenoid in the transmission.

Current is supplied to the A2 drive controller from one switched power circuit.

With the key switch in the run or accessories position, current is supplied to the 212 Red wires, F11 fuse, 552 Red wires, X4 connector to the W9 wiring harness to the 552 Red wires and the A3 terminal of the X33 connector and the drive controller. This power supply is turned off when the key switch is in the start position.

These circuits power the drive controller to allow for drive control operation. The 673A Org wire splices to the 673 Org wires to provide current from the drive controller to the throttle position sensor, forward pedal sensor, reverse pedal sensor, motion match switch (optional), and the MFWD speed sensor.

When the forward pedal is pressed, the forward pedal sensor rotates and sends a voltage back to the drive controller (terminal F2) through the 686 Lt Blu wire. The drive controller then processes this input voltage into an output command if the proper operating conditions exist. The output command (current) to the forward proportional solenoid is proportional to the pedal position.

The proper conditions for a forward function will be:

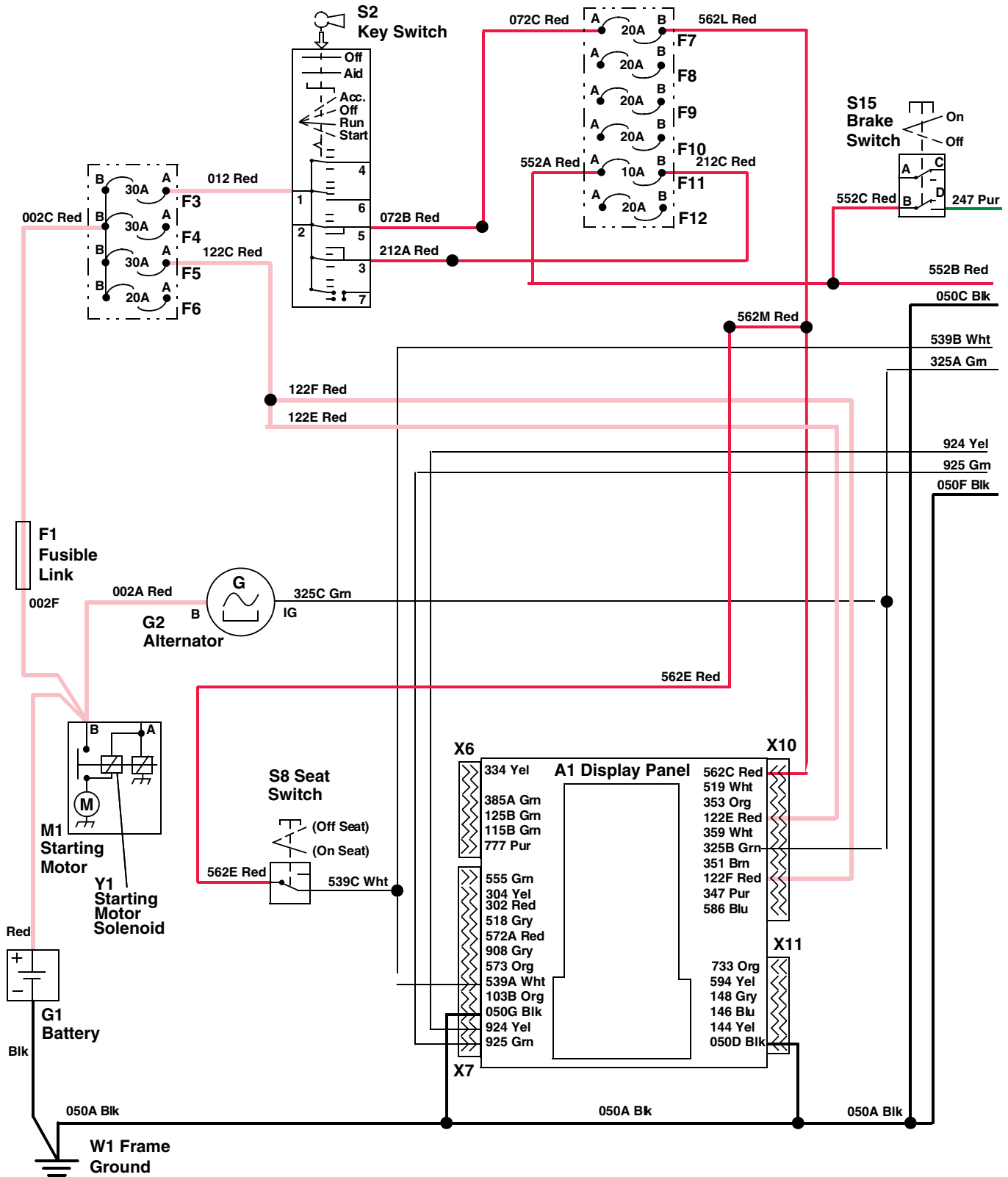
- 12.0 volt input on wire 552 Red wire (terminal A3), power on,
- 12.0 volt input on wire 539 Wht wire (terminal J3), operator on seat,
- 5.0 volt output on wire 673A Org wire (terminal B1), sensor power,
- Continuity to ground on 550A Blk wire (terminal C2),
- Continuity to ground on 050B Blk wire (terminal E2), drive controller ground,
- Voltage input on the 686 Lt Blu wire (terminal F2), forward pedal pressed,
- Frequency input on the 325 Grn wire (terminal F3), engine speed from the alternator,
- Voltage input on the 499 Wht wire (terminal G2), throttle position sensor,
- Frequency input on the 502 Red wire (terminal G3), MFWD speed sensor,
- Voltage input on the 687 Pur wire (terminal H3), reverse pedal not pressed,
- Current output up to 1900 mA on 696 Blu wire (terminal K2), forward proportional solenoid energized, and
- No current output on 697 Pur wire (terminal H3), reverse proportional solenoid not energized.

With the proper commands, the drive controller will ramp the output to the forward proportional solenoid to allow the machine to travel forward at a speed proportional to the position of the forward pedal, based upon the engine rpm and the range gear selected.

If at any time during the drive function the drive controller detects a problem with any of the input or output commands, the drive controller (terminal H2) will provide output current on wire 924 Yel to the display panel. The LCD on the display panel will then display a fault code. This code can then be matched to the fault code chart to assist in the diagnosis of the problem. (See [Display Panel Fault Codes](#) in Section 50, Group 30.)

KN52281,10043B1 -19-23OCT12-1/1

eHydro™—Forward Drive Circuit Electrical Schematic—Pre MY08



LVAL12047 —UN—17NOV10

Continued on next page

KN52281,10043B2 -19-01NOV12-1/4

A1—Display Panel
F1— Fusible Link
F3— Fuse 30A
F4— Fuse 30A
F5— Fuse 30A
F6— Fuse 20A
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A

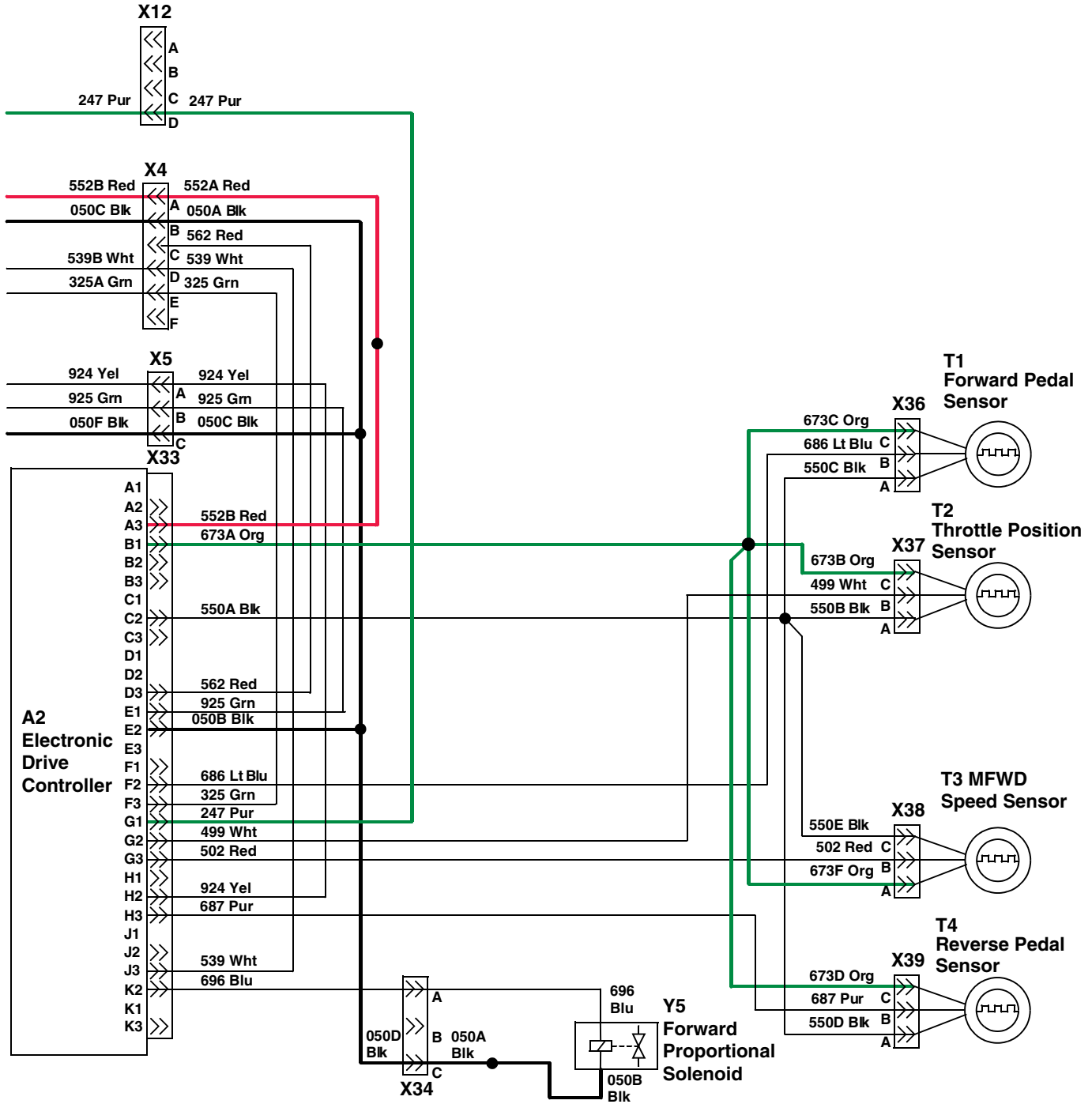
F10— Fuse 20A
F11— Fuse 10A
F12— Fuse 20A
G1—Battery
G2—Alternator
M1—Starting Motor
S2— Key Switch
S8— Seat Switch
S15— Brake Switch

W1—Frame Ground
X6— W1 Main Wiring Harness to
A1 Display Panel
X7— W1 Main Wiring Harness to
A1 Display Panel
X10— W1 Main Wiring Harness
to A1 Display Panel

X11— W1 Main Wiring Harness
to A1 Display Panel
Y1— Starting Motor Solenoid

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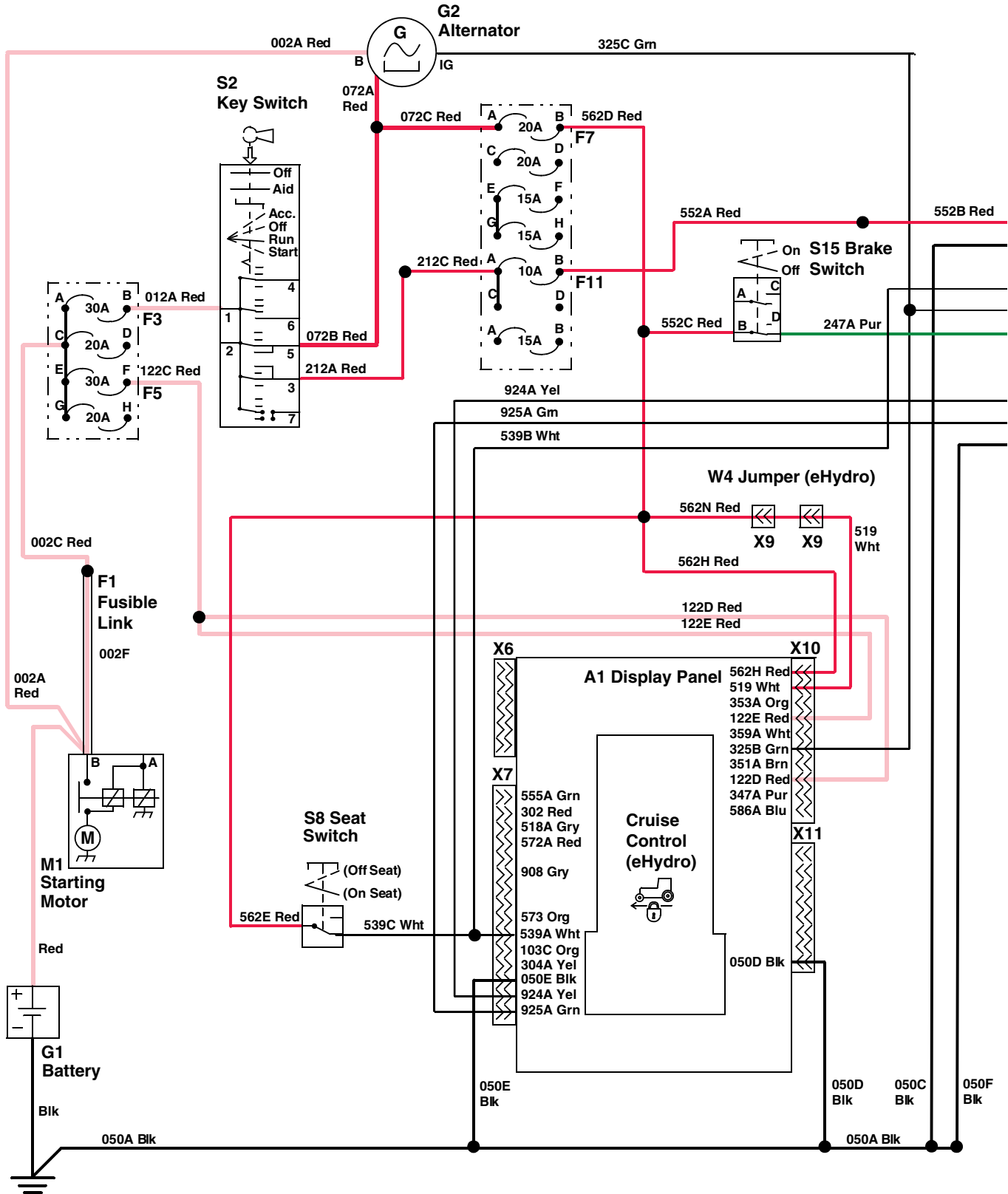
KN52281,10043B2 -19-01NOV12-3/4

A2—Electronic Drive Controller	X5—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X36— W9 eHydro™ Wiring Harness to T1 Forward Pedal Sensor	Y5—Forward Proportional Solenoid
T1— Forward Pedal Sensor			
T2— Throttle Position Sensor			
T3— Speed Sensor	X12— W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X37— W9 eHydro™ Wiring Harness to T2 Throttle Position Sensor	
T4— Reverse Pedal Sensor			
X4—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X33— W9 eHydro™ Wiring Harness to A2 Electronic Drive Controller	X38— W9 eHydro™ Wiring Harness to T3 MFWD Speed Sensor	
	X34— W9 eHydro™ Wiring Harness to W10 Proportional Valve Wiring Harness	X39— W9 eHydro™ Wiring Harness to T4 Reverse Pedal Sensor	

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eHydro™—Forward Drive Circuit Electrical Schematic—MY08



LVAL12049 —UN—17NOV10

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KN52281,10043B3 -19-23OCT12-1/3

A1—Display Panel
 F1— Fusible Link
 F3— Fuse 30A
 F5— Fuse 30A
 F7— Fuse 20A
 F11— Fuse 10A
 G1—Battery
 G2—Alternator
 M1—Starting Motor
 S2—Key Switch

S8—Seat Switch
 S15— Brake Switch
 W1—Frame Ground
 W4—Jumper Plug (eHydro™)
 X6— W1 Main Wiring Harness to
 A1 Display Panel
 X7— W1 Main Wiring Harness to
 A1 Display Panel

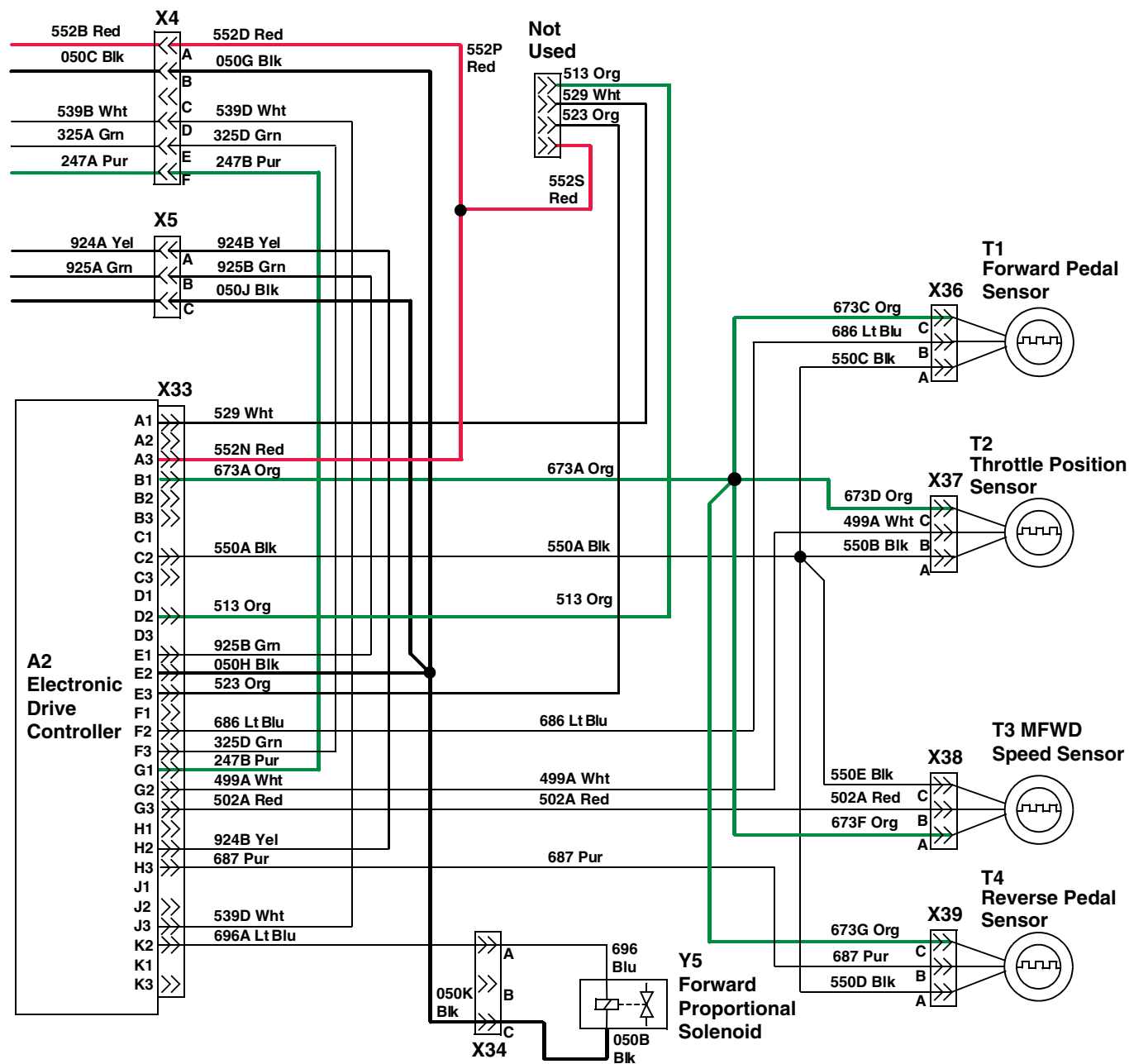
X9— W1 Main Wiring Harness to
 S11 Transmission Neutral
 Switch (PRT), W4 Jumper
 Plug (eHydro™)
 X10— W1 Main Wiring Harness
 to A1 Display Panel

X11— W1 Main Wiring Harness
 to A1 Display Panel

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KN52281,10043B3 -19-23OCT12-2/3



A2—Electronic Drive Controller
T1— Forward Pedal Sensor
T2— Throttle Position Sensor
T3— Speed Sensor
T4— Reverse Pedal Sensor
X4—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness

X5—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness
X33— W9 eHydro™ Wiring Harness to A2 Electronic Drive Controller
X34— W9 eHydro™ Wiring Harness to W10 Proportional Valve Wiring Harness

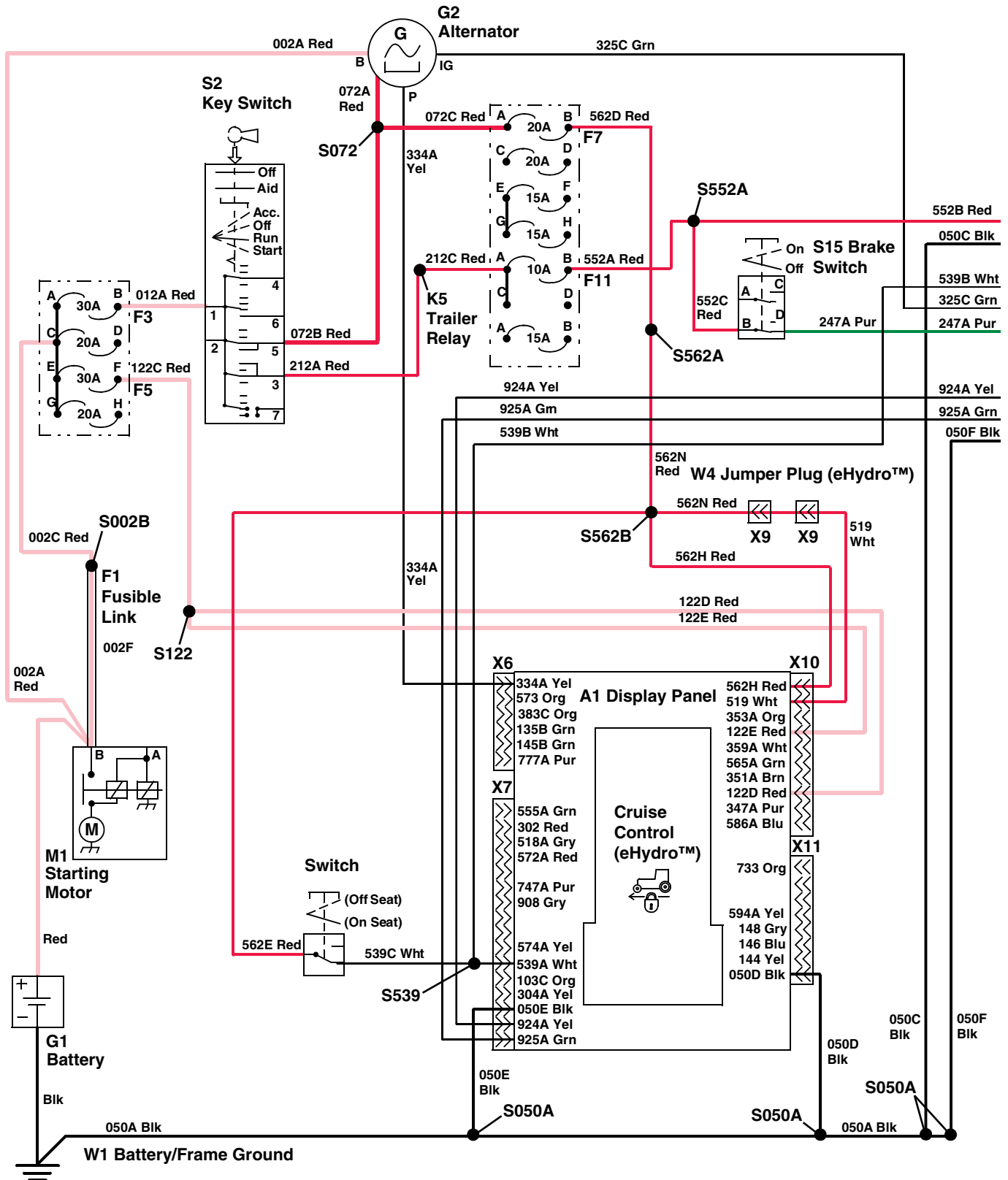
X36— W9 eHydro™ Wiring Harness to T1 Forward Pedal Sensor
X37— W9 eHydro™ Wiring Harness to T2 Throttle Position Sensor
X38— W9 eHydro™ Wiring Harness to T3 MFWD Speed Sensor

X39— W9 eHydro™ Wiring Harness to T4 Reverse Pedal Sensor
Y5—Forward Proportional Solenoid

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LVAL12050 —UN—17NOV10

eHydro™—Forward Drive Circuit Electrical Schematic—MY13



LVAL38898 —UN—15JAN13

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KN52281,10043D6 -19-10JAN13-1/3

A1—Display Panel
 F1—Fusible Link
 F3—Fuse 30A
 F5—Fuse 30A
 F7—Fuse 20A
 F11—Fuse 10A
 G1—Battery
 G2—Alternator
 M1—Starting Motor
 S2—Key Switch

S8—Seat Switch
 S15—Brake Switch
 W1—Battery/Frame Ground
 W4—Jumper Plug (eHydro™)
 X6—W1 Main Wiring Harness to
 A1 Display Panel
 X7—W1 Main Wiring Harness to
 A1 Display Panel

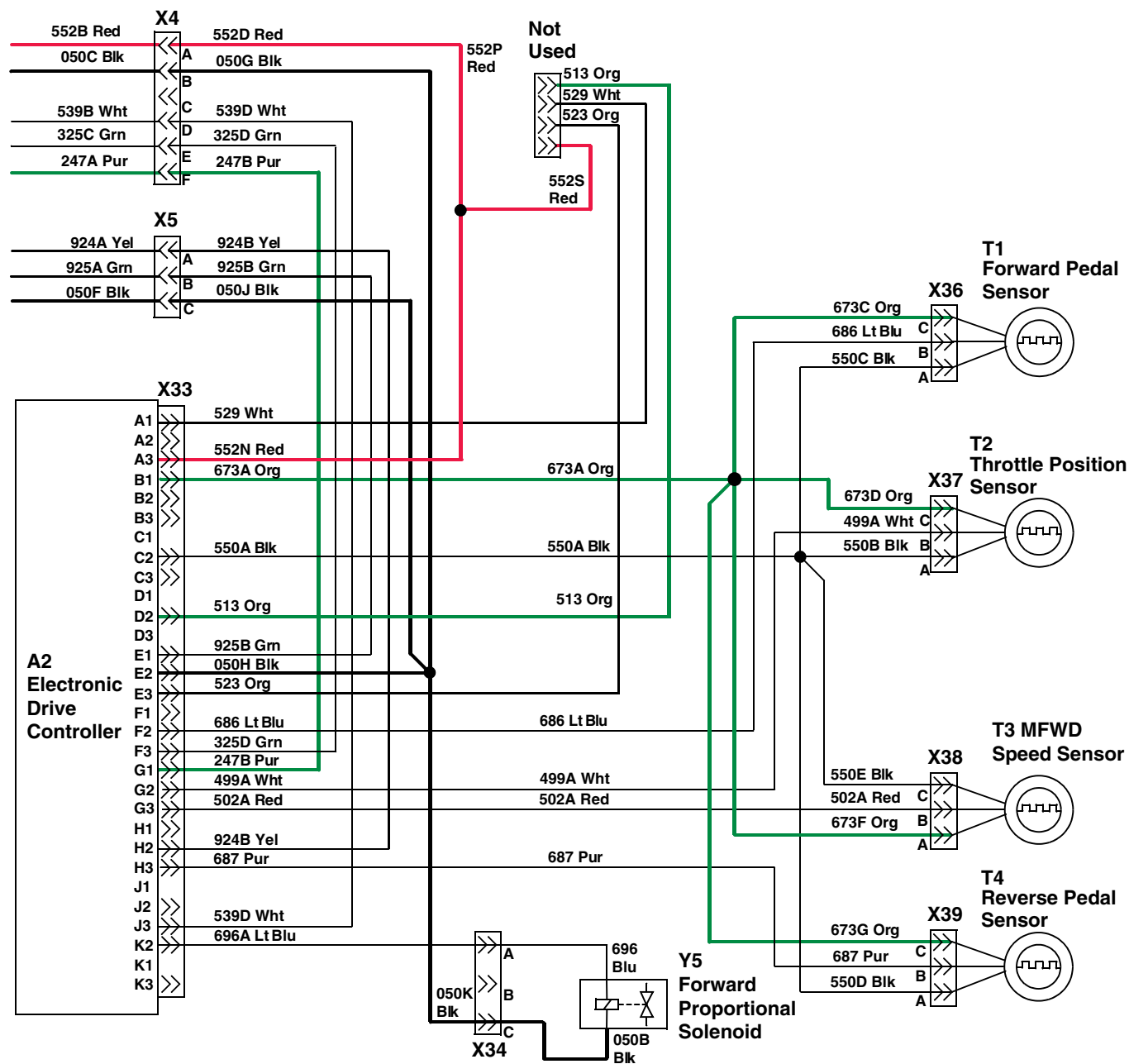
X9—W1 Main Wiring Harness to
 S11 Transmission Neutral
 Switch (PRT), W4 Jumper
 Plug (eHydro™)
 X10—W1 Main Wiring Harness
 to A1 Display Panel

X11—W1 Main Wiring Harness
 to A1 Display Panel

eHydro is a trademark of Deere & Company

Continued on next page

KN52281,10043D6 -19-10JAN13-2/3



LVAL38899 — UN—26NOV12

A2—Electronic Drive Controller
T1— Forward Pedal Sensor
T2— Throttle Position Sensor
T3— MFWD Speed Sensor
T4— Reverse Pedal Sensor
X4—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness

X5—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness
X33— W9 eHydro™ Wiring Harness to A2 Electronic Drive Controller
X34— W9 eHydro™ Wiring Harness to W10 Proportional Valve Wiring Harness

X36— W9 eHydro™ Wiring Harness to T1 Forward Pedal Sensor
X37— W9 eHydro™ Wiring Harness to T2 Throttle Position Sensor
X38— W9 eHydro™ Wiring Harness to T3 MFWD Speed Sensor

X39— W9 eHydro™ Wiring Harness to T4 Reverse Pedal Sensor
Y5—Forward Proportional Solenoid

eHydro is a trademark of Deere & Company

KN52281,10043D6 -19-10JAN13-3/3

eHydro™—Forward Drive Circuit Diagnosis

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on eHydro™ models. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.) and follow Diagnostic Mode 2 (eHydro/Auto HST). The diagnostic mode will provide a reading of current drive component operating values such as voltage, current, or frequency.

eHydro is a trademark of Deere & Company

Tool Name	Tool No.	Tool Use
Break-out Box	JDG1575 Test Kit	Test the electrical circuits of the electronic drive controller.

Test Procedure A

Test Conditions:

- Park brake locked.
- Operator on seat.
- Drive pedals released.
- Key switch in run position, engine not running.

KN52281,10043B4 -19-23OCT12-1/6

Forward Drive Circuit

KN52281,10043B4 -19-23OCT12-2/6

Step 1

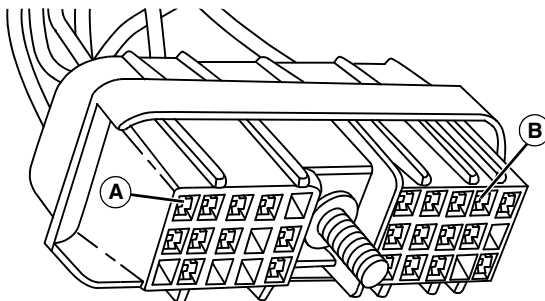
Do any fault codes appear in the LCD display?

YES: Correct the possible faults. (See [Display Panel Fault Code Chart](#) in Section 50, Group 30.)

NO: Go to next step.

KN52281,10043B4 -19-23OCT12-3/6

Step 2



LVAL12051 —UN—17NOV10

A—Terminal A3, 552 Red Wire

B—Terminal J3 539 Wht Wire

Disconnect the X33 connector to the drive controller. Is battery voltage present at terminal A3, 552 Red wire (A), and terminal J3 539 Wht wire (B)?

YES: Connect the X33 connector to the drive controller. Go to next step.

NO: 552 Red wire. Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

NO: 539 Wht wire. Ensure that seat switch is closed. Test seat switch as needed. Check 539 Wht wires and connections. Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

Continued on next page

KN52281,10043B4 -19-23OCT12-4/6

<p>Step 3</p>	<p>Test the forward pedal sensor. (See Entering Diagnostic and Calibration Modes in Section 40, Group 45.), and/or (see eHydro™—Forward and Reverse Pedal Sensor Test and Adjustment in Section 40, Group 50.) Does the pedal sensor measure within specification?</p>	<p>YES: Go to next step.</p> <p>NO: Adjust, repair, or replace components as directed in the pedal sensor test.</p> <p>KN52281,10043B4 -19-23OCT12-5/6</p>
<p>Step 4</p>	<p>Test the forward proportional solenoid coil. (See Entering Diagnostic and Calibration Modes in Section 40, Group 45.) Does the solenoid coil measure within specification?</p>	<p>YES: Electrical test complete. Test the hydrostatic power train. (See Hydrostatic Transmission Operation in Section 70, Group 20.) of the Power Train—Hydrostatic Section.</p> <p>NO: Adjust, repair, or replace components as directed in the proportional solenoid coil test.</p> <p>KN52281,10043B4 -19-23OCT12-6/6</p>

eHydro™—Reverse Drive Circuit Operation

Function:

The reverse drive circuit causes the electronic drive controller to propel the machine in a controlled reverse direction.

Additionally the electronic drive controller provides for setting the following functions during a reverse drive:

- Maximum travel speed
- Motion match (pedal responsiveness)
- Load match

Each of these additional functions has the ability to be turned on or off by the operator.

Operating Conditions:

- Key switch in run position
- Engine running,
- Operator on seat
- Park brake unlocked
- Reverse pedal depressed

Theory of Operation:

The electronic drive controller (drive controller) is a preprogrammed electrical device that allows the operator to control the machine reverse drive function and speed via the electrical inputs from the reverse foot pedal. Under normal operating conditions, this creates an output to the reverse proportional solenoid in the transmission.

Current is supplied to the A2 drive controller from the switched power circuit.

With the key switch in the run or accessories position, current is supplied to the 212 Red wires, F11 fuse, 552 Red wires, X4 connector to the W9 wiring harness to the 552 Red wires and the A3 terminal of the X33 connector and the drive controller. This power supply is turned off when the key switch is in the start position.

These circuits power the drive controller to allow for drive control operation. The 673A Org wire (X33 terminal B1) splices to the 673 Org wires to provide current from the drive controller to the throttle position sensor, forward pedal sensor, reverse pedal sensor, motion match switch (optional), and the MFWD speed sensor.

When the reverse pedal is pressed, the reverse pedal sensor rotates and sends a voltage back to the drive controller (terminal K3) through the 687 Pur wire. The drive controller then processes this input voltage into an output command if the proper operating conditions exist. The output command (current) to the reverse proportional solenoid is proportional to the pedal position.

The proper conditions for a reverse function will be:

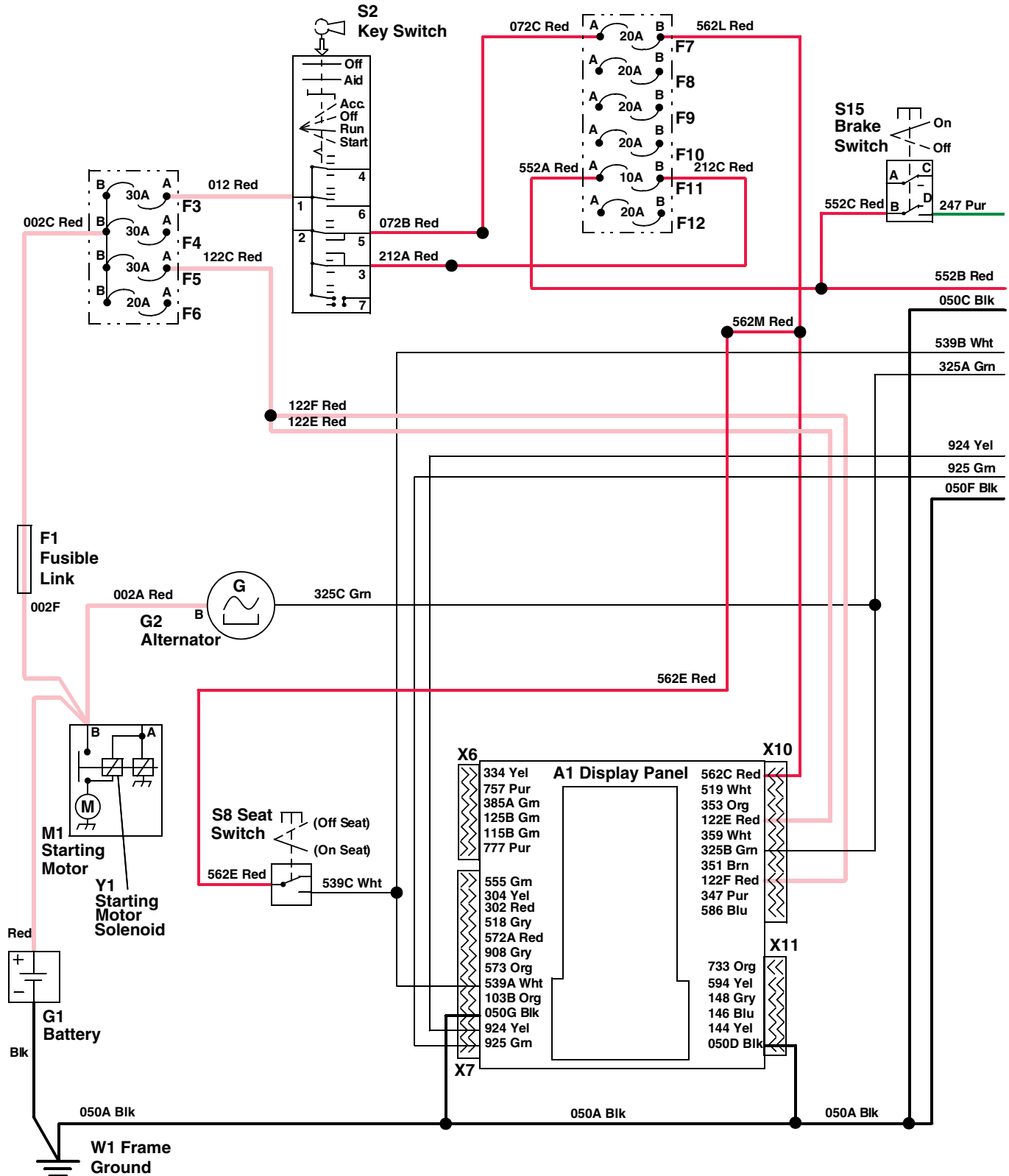
- 12.0 volt input on wire 552 Red wire (terminal A3), power ON
- 12.0 volt input on wire 539 Wht wire (terminal J3), operator on seat
- 5.0 volt output on wire 673A Org wire (terminal B1), sensor power
- Continuity to ground on 550A Blk wire (terminal C2)
- Continuity to ground on 050B Blk wire (terminal E2), drive controller ground
- Voltage input on the 687 Pur wire (terminal H3), reverse pedal pressed
- Frequency input on the 325 Grn wire (terminal F3), engine speed from the alternator
- Voltage input on the 499 Wht wire (terminal G2), throttle position sensor
- Frequency input on the 502 Red wire (terminal G3), MFWD speed sensor
- Voltage input on the 686 Lt Blu wire (terminal F2), forward pedal not pressed
- Current output up to 1900 mA on 697 Pur wire, reverse proportional solenoid energized (terminal K3)
- No current output on 696 Blu wire (terminal K2), forward proportional solenoid not energized

With the proper commands, the drive controller will ramp the output to the reverse proportional solenoid to allow the machine to travel reverse at a speed proportional to the position of the reverse pedal, based upon the engine rpm and the range gear selected.

If at any time during the drive function the drive controller detects a problem with any of the input or output commands, the drive controller (terminal H2) will provide output current on wire 924 Yel to the display panel. The LCD on the display panel will then display a fault code. This code can then be matched to the fault code chart to assist in the diagnosis of the problem. (See [Display Panel Fault Codes](#) in Section 50, Group 30.)

KN52281,10043B5 -19-23OCT12-1/1

eHydro™—Reverse Drive Circuit Electrical Schematic—Pre MY08



LVAL12052 —UN—17NOV10

Continued on next page

KN52281,10043B6 -19-01NOV12-1/4

A1—Display Panel
F1— Fusible Link
F3— Fuse 30A
F4— Fuse 30A
F5— Fuse 30A
F6— Fuse 20A
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A

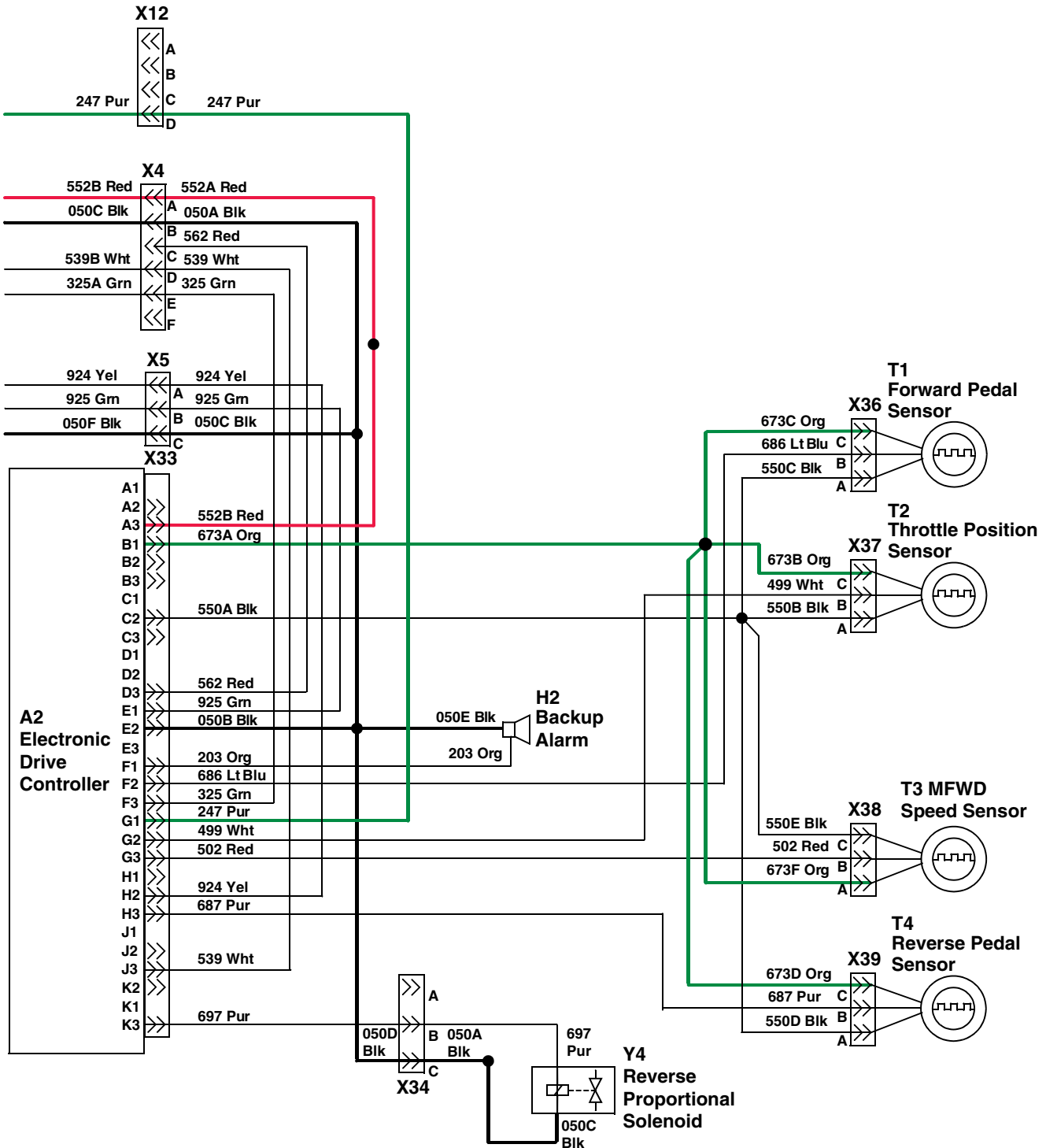
F10— Fuse 20A
F11— Fuse 10A
F12— Fuse 20A
G1—Battery
G2—Alternator
M1—Starting Motor
S2— Key Switch
S8— Seat Switch
S15— Brake Switch

W1—Frame Ground
X6— W1 Main Wiring Harness to
A1 Display Panel
X7— W1 Main Wiring Harness to
A1 Display Panel
X10— W1 Main Wiring Harness
to A1 Display Panel

X11— W1 Main Wiring Harness
to A1 Display Panel
Y1— Starting Motor Solenoid

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KN52281,10043B6 -19-01NOV12-2/4



LVAL12053 —UN—17NOV10

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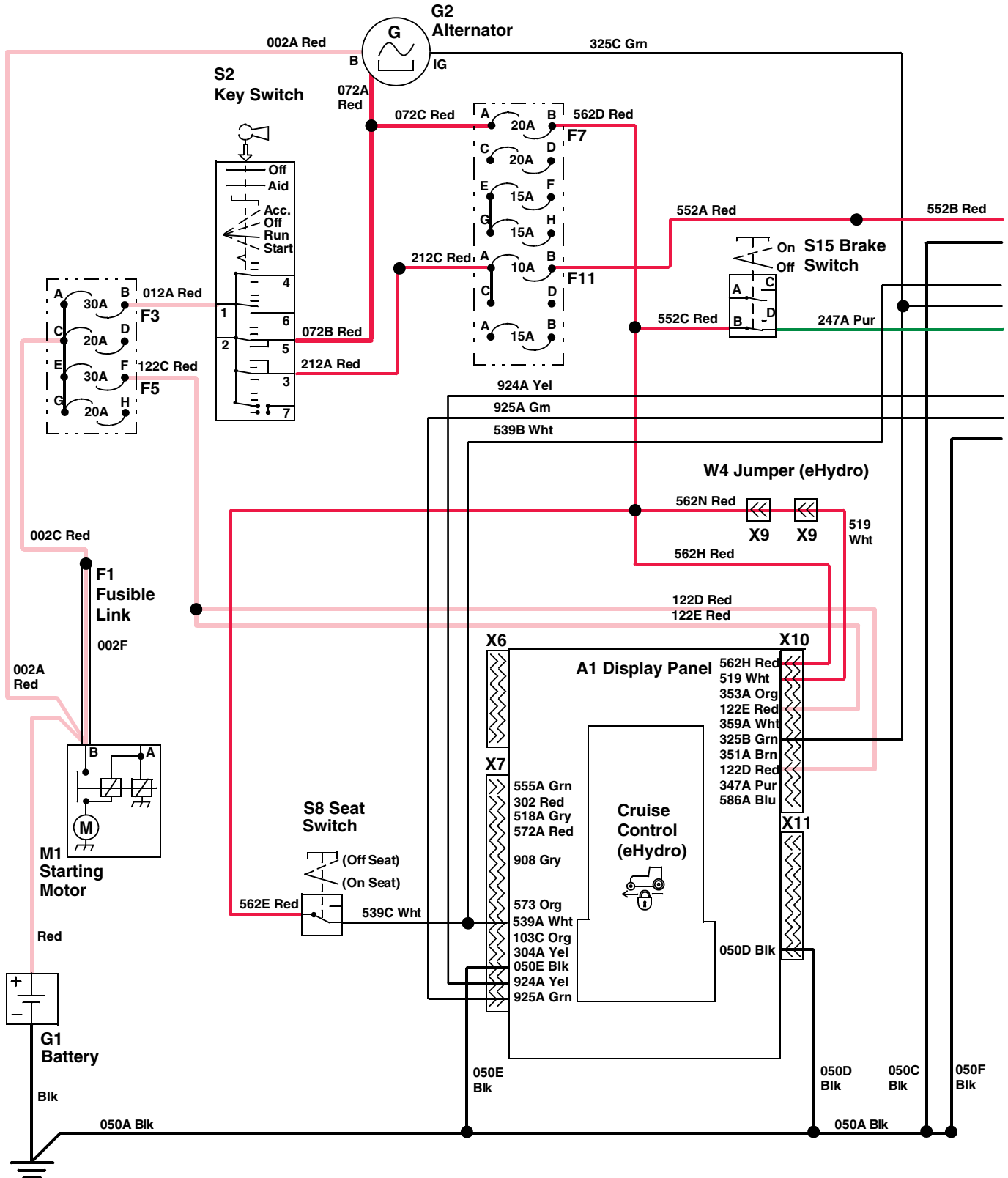
KN52281,10043B6 -19-01NOV12-3/4

A2—Electronic Drive Controller	X5—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X36— W9 eHydro™ Wiring Harness to T1 Forward Pedal Sensor	Y4—Reverse Proportional Solenoid
H2—Backup Alarm			
T1— Forward Pedal Sensor	X12— W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X37— W9 eHydro™ Wiring Harness to T2 Throttle Position Sensor	
T2— Throttle Position Sensor			
T3— Speed Sensor	X33— W9 eHydro™ Wiring Harness to A2 Electronic Drive Controller	X38— W9 eHydro™ Wiring Harness to T3 MFWD Speed Sensor	
T4— Reverse Pedal Sensor	X34— W9 eHydro™ Wiring Harness to W10 Proportional Valve Wiring Harness	X39— W9 eHydro™ Wiring Harness to T4 Reverse Pedal Sensor	
X4—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness			

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KN52281,10043B6 -19-01NOV12-4/4

eHydro™—Reverse Drive Circuit Electrical Schematic—MY08



LVAL12054—UN—17NOV10

Continued on next page

KN52281,10043B7 -19-23OCT12-1/4

A1—Display Panel
F1—Fusible Link
F3—Fuse 30A
F5—Fuse 30A
F7—Fuse 20A
F11—Fuse 10A
G1—Battery
G2—Alternator
M1—Starting Motor

S2—Key Switch
S8—Seat Switch
S15—Brake Switch
W4—Jumper Plug (eHydro™)
X6—W1 Main Wiring Harness to
A1 Display Panel
X7—W1 Main Wiring Harness to
A1 Display Panel

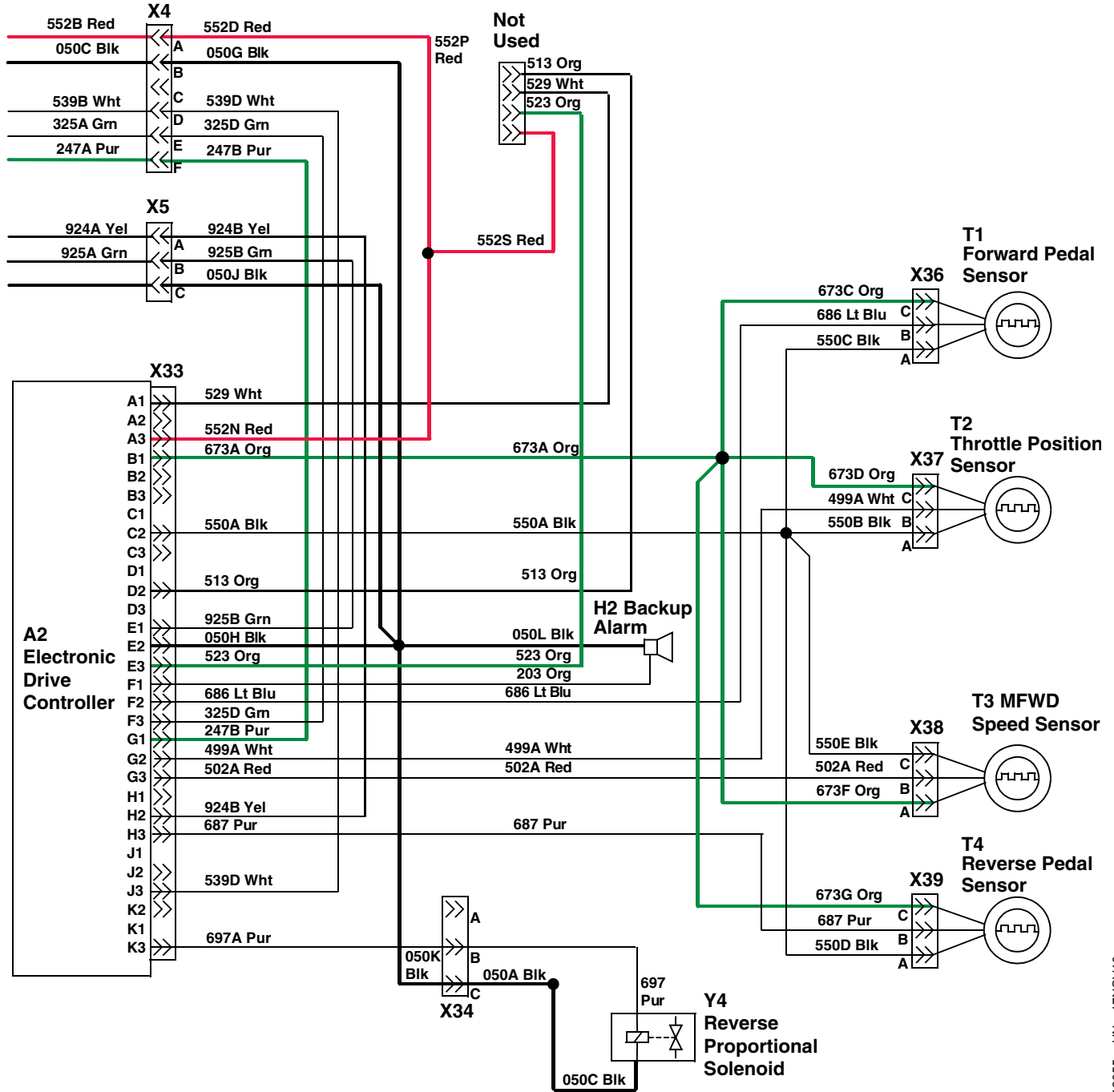
X9—W1 Main Wiring Harness to
S11 Transmission Neutral
Switch (PRT), W4 Jumper
Plug (eHydro™)
X10—W1 Main Wiring Harness
to A1 Display Panel

X11—W1 Main Wiring Harness
to A1 Display Panel

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KN52281,10043B7 -19-23OCT12-2/4



LVAL12055—UN—17NOV10

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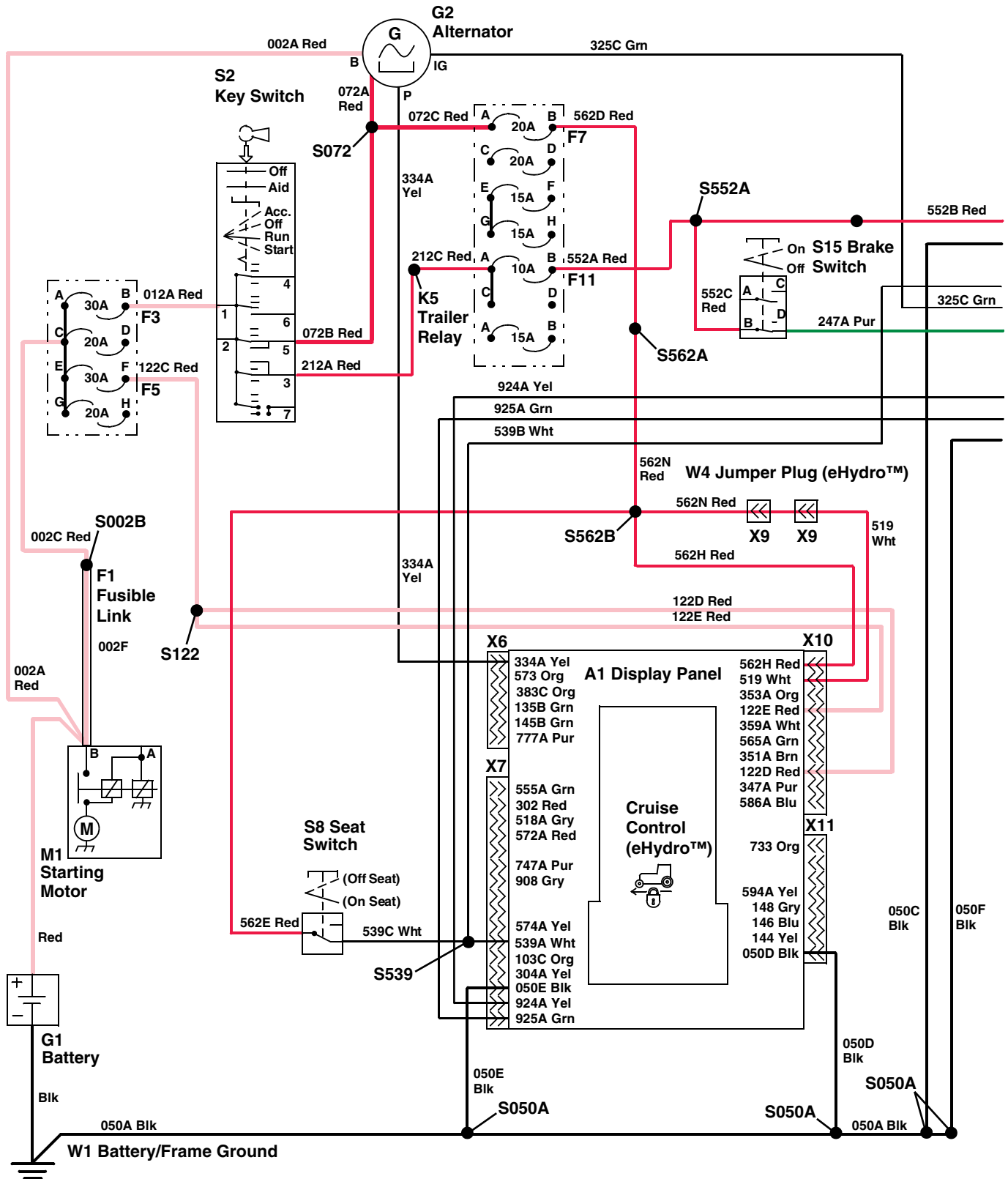
KN52281,10043B7 -19-23OCT12-3/4

A2—Electronic Drive Controller	X5—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X36— W9 eHydro™ Wiring Harness to T1 Forward Pedal Sensor	Y4—Reverse Proportional Solenoid
H2—Backup Alarm			
T1— Forward Pedal Sensor			
T2— Throttle Position Sensor	X33— W9 eHydro™ Wiring Harness to A2 Electronic Drive Controller	X37— W9 eHydro™ Wiring Harness to T2 Throttle Position Sensor	
T3— Speed Sensor			
T4— Reverse Pedal Sensor			
X4—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X34— W9 eHydro™ Wiring Harness to W10 Proportional Valve Wiring Harness	X38— W9 eHydro™ Wiring Harness to T3 MFWD Speed Sensor	
		X39— W9 eHydro™ Wiring Harness to T4 Reverse Pedal Sensor	

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KN52281,10043B7 -19-23OCT12-4/4

eHydro™—Reverse Drive Circuit Electrical Schematic—MY13



LVAL38900 —UN—15JAN13

Continued on next page

KN52281,10043D7 -19-10JAN13-1/4

A1—Display Panel
F1—Fusible Link
F3—Fuse 30A
F5—Fuse 30A
F7—Fuse 20A
F11—Fuse 10A
G1—Battery
G2—Alternator
M1—Starting Motor

S2—Key Switch
S8—Seat Switch
S15—Brake Switch
W1—Battery/Frame Ground
W4—Jumper Plug
X6—W1 Main Wiring Harness to
A1 Display Panel

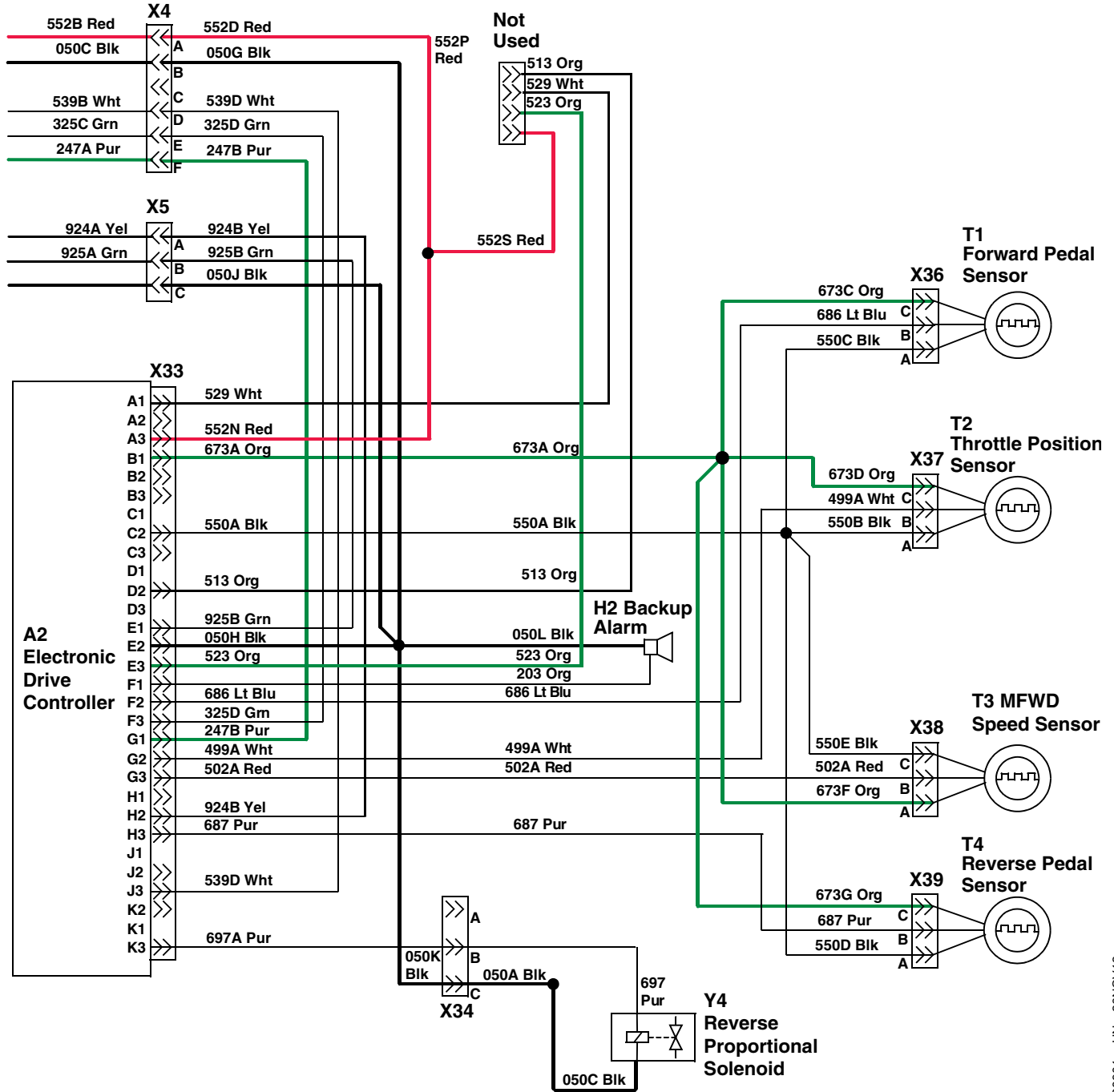
X7—W1 Main Wiring Harness to
A1 Display Panel
X9—W1 Main Wiring Harness to
S11 Transmission Neutral
Switch (PRT), W4 Jumper
Plug (eHydro™)

X10—W1 Main Wiring Harness
to A1 Display Panel
X11—W1 Main Wiring Harness
to A1 Display Panel

eHydro is a trademark of Deere & Company

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KN52281,10043D7 -19-10JAN13-2/4



LVAL38901—UN—26NOV12

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KN52281,10043D7 -19-10JAN13-3/4

A2—Electronic Drive Controller
H2—Backup Alarm
T1—Forward Pedal Sensor
T2—Throttle Position Sensor
T3—MFWD Speed Sensor
T4—Reverse Pedal Sensor
X4—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness

X5—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness
X33—W9 eHydro™ Wiring Harness to A2 Electronic Drive Controller
X34—W9 eHydro™ Wiring Harness to W10 Proportional Valve Wiring Harness

X36—W9 eHydro™ Wiring Harness to T1 Forward Pedal Sensor
X37—W9 eHydro™ Wiring Harness to T2 Throttle Position Sensor
X38—W9 eHydro™ Wiring Harness to T3 MFWD Speed Sensor
X39—W9 eHydro™ Wiring Harness to T4 Reverse Pedal Sensor

Y4—Reverse Proportional Solenoid

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KN52281,10043D7 -19-10JAN13-4/4

eHydro™—Reverse Drive Circuit Diagnosis

Test Procedure A

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on eHydro™ models. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.), and specifically see Diagnostic Mode 2 (eHydro/Auto HST). The diagnostic mode will provide a reading of current drive component operating values such as voltage, current, or frequency.

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Tool Name	Tool No.	Tool Use
Break-out Box	JDG1575 Test Kit	Test the electrical circuits of the electronic drive controller.

Test Conditions:

- Park brake locked.
- Operator on seat.
- Drive pedals released.
- Key switch in run position, engine not running.

KN52281,10043B8 -19-23OCT12-1/6

Reverse Drive Circuit

KN52281,10043B8 -19-23OCT12-2/6

Step 1

Do any fault codes appear in the LCD display?

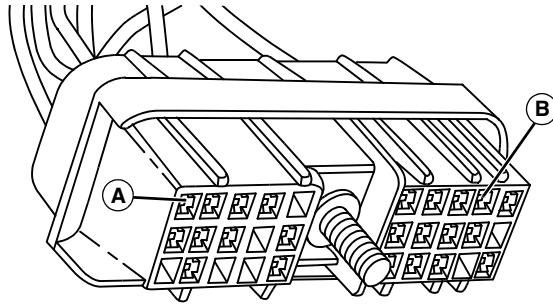
YES: Correct the possible faults. (See [Display Panel Fault Code Chart](#) in Section 50, Group 30.)

NO: Go to next step.

Continued on next page

KN52281,10043B8 -19-23OCT12-3/6

Step 2



LVAL12056 —UN—17NOV10

A—Terminals A3, 552 Red Wire
B—Terminal J3 539 Wht Wire

Disconnect the X33 connector to the drive controller. Is battery voltage present at terminals A3, 552 Red wire (A), terminal D3, and terminal J3 539 Wht wire (B)?

YES: Connect the X33 connector to the drive controller. Go to next step.

NO: 552 Red wire. Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

NO: 539 Wht wire. Ensure seat switch is closed. Test seat switch as needed. Check 539 Wht wires and connections. Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

KN52281,10043B8 -19-23OCT12-4/6

Step 3

Test the reverse pedal sensor. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.) and/or (see [eHydro™—Forward and Reverse Pedal Sensor Test and Adjustment](#) in Section 40, Group 50.) Does the pedal sensor measure within specification?

YES: Go to next step.

NO: Adjust, repair, or replace components as directed in the pedal sensor test.

KN52281,10043B8 -19-23OCT12-5/6

Step 4

Test the reverse proportional solenoid coil. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.) Does the solenoid coil measure within specification?

YES: Electrical test complete. Test the hydrostatic power train. (See [Hydrostatic Transmission Operation](#) in Section 70, Group 20.) of the Power Train—Hydrostatic Section.

NO: Adjust, repair, or replace components as directed in the proportional solenoid coil test.

KN52281,10043B8 -19-23OCT12-6/6

eHydro™—Cruise Control Circuit Operation (Standard)

Function:

To control the machine's forward drive speed at a constant ground speed without having to use the forward drive pedal.

Operating Conditions:

- Key switch in run position
- Engine running
- Operator on seat
- Park brake unlocked
- Forward pedal pressed to desired speed while setting the drive speed
- Cruise switch on and pressed to the set position momentarily when the desired drive speed is attained

The cruise control will remain engaged until the brake is depressed; the key switch is turned to the off position; or, the cruise control switch is placed into the off position.

Theory of Operation:

The cruise control uses the electronic drive controller (drive controller) to allow the operator to set and hold a forward drive speed setting that the operator desires without having to press and hold the forward pedal.

The cruise control circuit uses the forward pedal sensor, alternator, throttle position sensor, and the MFWD speed sensor to provide input to the drive controller. The drive controller then processes these inputs to provide output current to the forward proportional solenoid.

Placing the cruise control switch to the on position, enables the cruise control function. Momentarily pressing the cruise switch to the set position will then set the cruise speed at the speed being traveled. Once set, the drive controller monitors the machine speed and varies the current to the forward proportional solenoid to maintain travel speed at the set point.

To adjust travel speed, disengage cruise control and engage cruise control again at a different speed.

Placing the cruise control switch in the off position or pressing either the right brake pedal or reverse pedal will disengage the cruise function.

Switched power is provided to the cruise control switch from the key switch, 212 Red wires, F11 fuse, and 552

Red wires in the W1 main wiring harness, X4 connector, 552 Red wires in the W9 eHydro™ wiring harness, X35 connector, and the 552A, 552B, and 552C Red wires in the W11 cruise control wiring harness.

When the cruise control switch is in the on position current is provided to the 238 Gry wire of the W11 and W9 wiring harnesses to the A2 drive controller (terminal B2). This input enables the cruise control function.

The next input signal needed to activate the cruise circuit is an input from the forward pedal sensor on wire 686 Lt Blu (terminal F2). This circuit causes an output on the 696 Blu wire (terminal K2) to the forward proportional solenoid which in turn causes the machine to move forward.

Once the drive controller is receiving an input from the forward pedal sensor, the cruise control switch may be pressed to the lock position momentarily to set the drive speed.

Momentarily pressing the cruise control switch to the lock position supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller (terminal B2). This input will set the cruise speed at the speed being traveled.

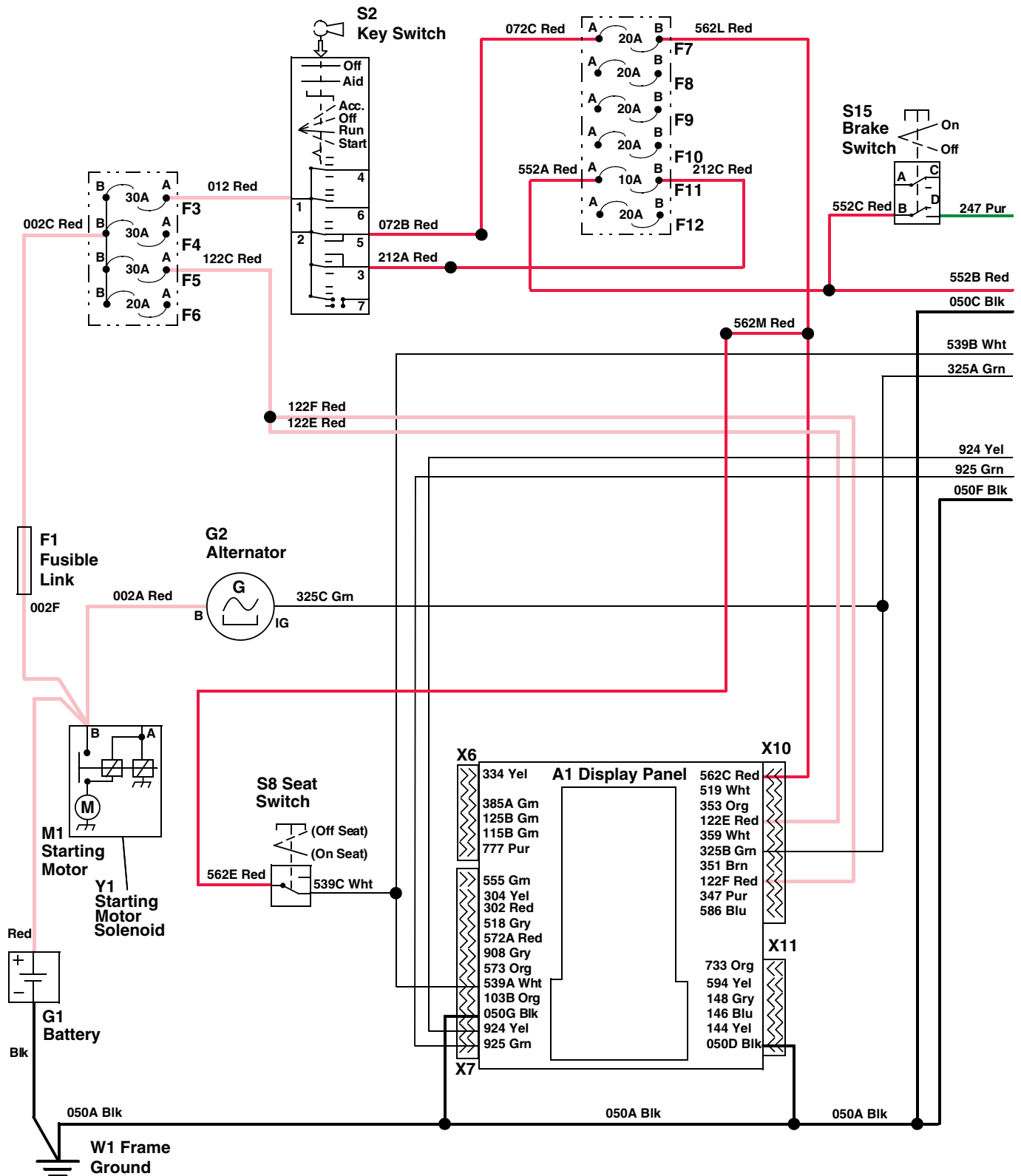
At the moment the lock signal is received by the drive controller, the drive controller records the inputs from the forward pedal sensor (686 Lt Blu), alternator (325 Grn), throttle position sensor (499 Wht), and the MFWD speed sensor (502 Red). The drive controller then supplies an output current to the forward proportional solenoid (696 Blu) to maintain the speed recorded at the MFWD speed sensor (terminal G3).

If changes in machine loading or range gear position settings do not allow the drive controller to maintain the speed setting, the drive controller will attempt to maintain the speed setting by sending either the maximum (fastest speed possible) or minimum (slowest speed possible) current to the forward proportional solenoid. If the machine is driving either up or down a grade, the drive controller will increase or decrease the output current to the forward proportional solenoid to maintain the speed at the MFWD speed sensor. If the operator changes the throttle position, the drive controller will again vary the output to the forward proportional solenoid to maintain the drive speed at the MFWD speed sensor.

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KN52281,10043B9 -19-23OCT12-1/1

eHydro™—Cruise Control Circuit Electrical Schematic (Standard)—Pre MY08



LVAL12057 —UN—17NOV10

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KN52281,10043BA -19-01NOV12-1/4

A1—Display Panel
F1— Fusible Link
F3— Fuse 30A
F4— Fuse 30A
F5— Fuse 30A
F6— Fuse 20A
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A

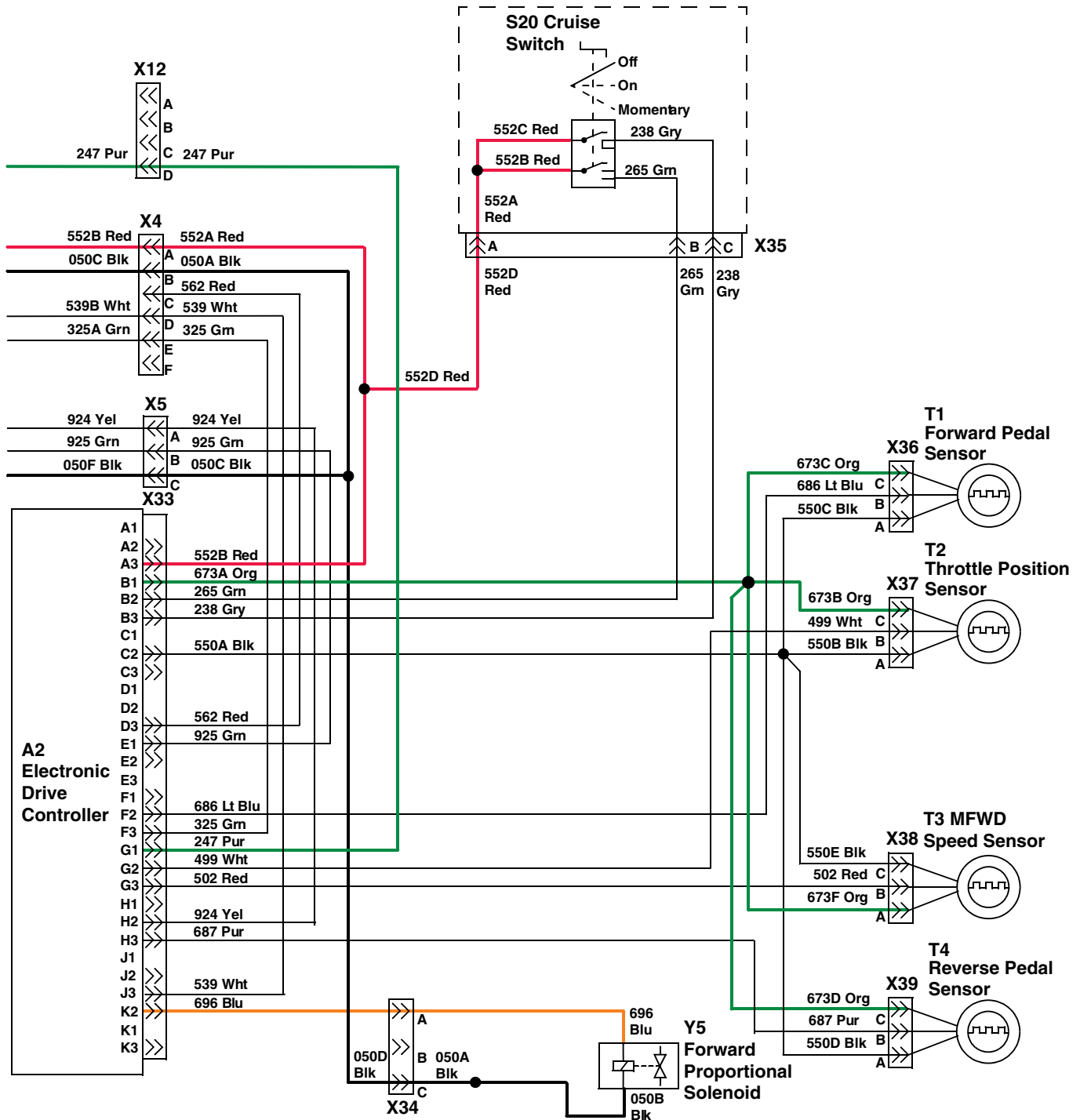
F10— Fuse 20A
F11— Fuse 10A
F12— Fuse 20A
G1—Battery
G2—Alternator
M1—Starting Motor
S2— Key Switch
S8— Seat Switch
S15— Brake Switch

W1—Frame Ground
X6— W1 Main Wiring Harness to
A1 Display Panel
X7— W1 Main Wiring Harness to
A1 Display Panel
X10— W1 Main Wiring Harness
to A1 Display Panel

X11— W1 Main Wiring Harness
to A1 Display Panel
Y1— Starting Motor Solenoid

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KN52281,10043BA -19-01NOV12-2/4



LVAL12058—UN—17NOV10

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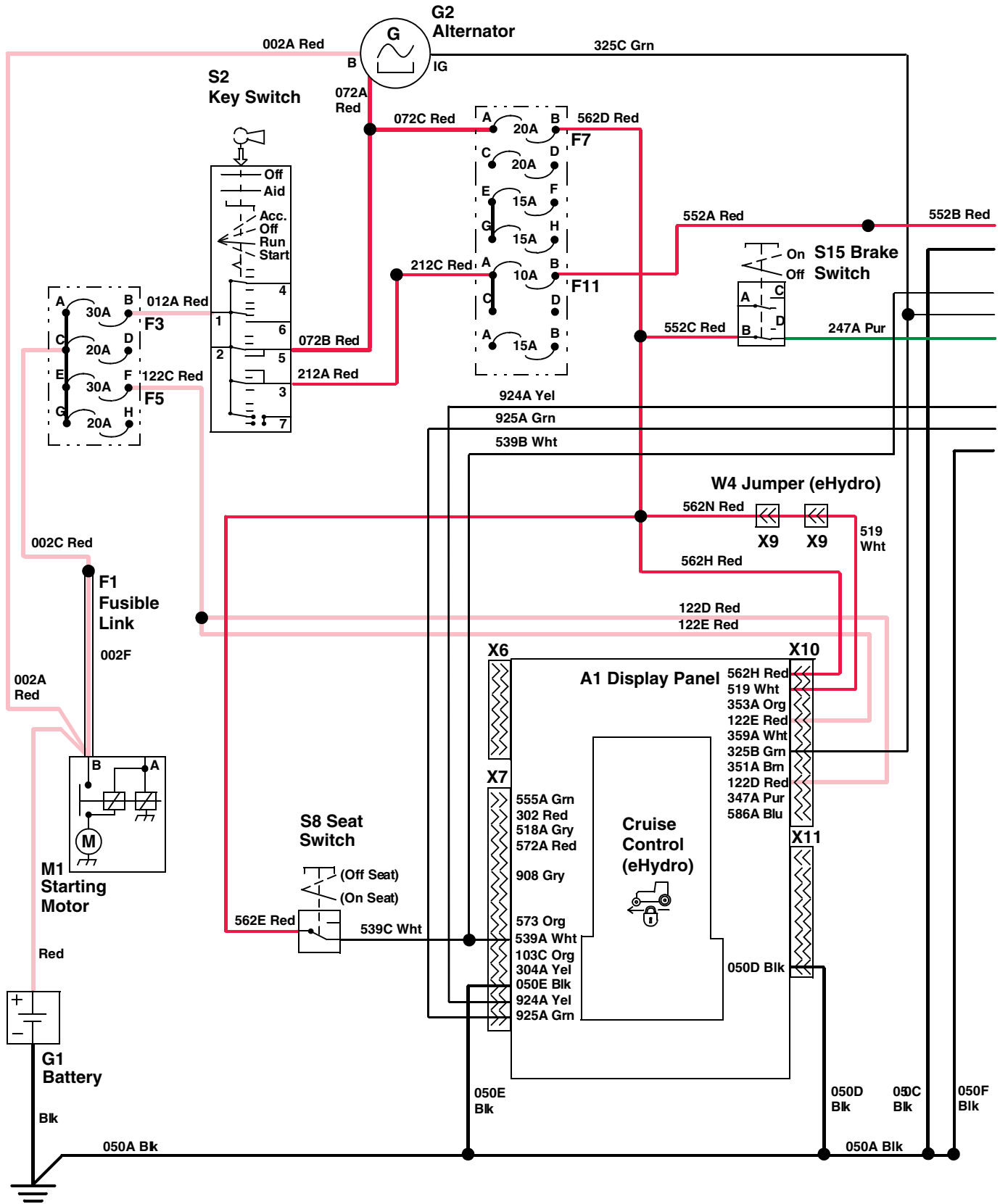
KN52281,10043BA -19-01NOV12-3/4

A2—Electronic Drive Controller	X5—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X35— W9 eHydro™ Wiring Harness to W12 Cruise Control Wiring Harness (optional)	X39— W9 eHydro™ Wiring Harness to T4 Reverse Pedal Sensor
S20— Cruise Control Switch (standard)			Y5— Forward Proportional Solenoid
T1— Forward Pedal Sensor	X12— W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X36— W9 eHydro™ Wiring Harness to T1 Forward Pedal Sensor	
T2— Throttle Position Sensor			
T3— Speed Sensor	X33— W9 eHydro™ Wiring Harness to A2 Electronic Drive Controller	X37— W9 eHydro™ Wiring Harness to T2 Throttle Position Sensor	
T4— Reverse Pedal Sensor			
X4— W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X34— W9 eHydro™ Wiring Harness to W10 Proportional Valve Wiring Harness	X38— W9 eHydro™ Wiring Harness to T3 MFWD Speed Sensor	

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KN52281,10043BA -19-01NOV12-4/4

eHydro™—Cruise Control Circuit Electrical Schematic (Standard)—MY08



LVAL12059 —UN—17NOV10

Continued on next page

KN52281,10043BB -19-23OCT12-1/4

A1—Display Panel
F1—Fusible Link
F3—Fuse 30A
F5—Fuse 30A
F7—Fuse 20A
F11—Fuse 10A
G1—Battery
G2—Alternator
M1—Starting Motor

S2—Key Switch
S8—Seat Switch
S15—Brake Switch
W4—Jumper Plug (eHydro™)
X6—W1 Main Wiring Harness to
A1 Display Panel
X7—W1 Main Wiring Harness to
A1 Display Panel

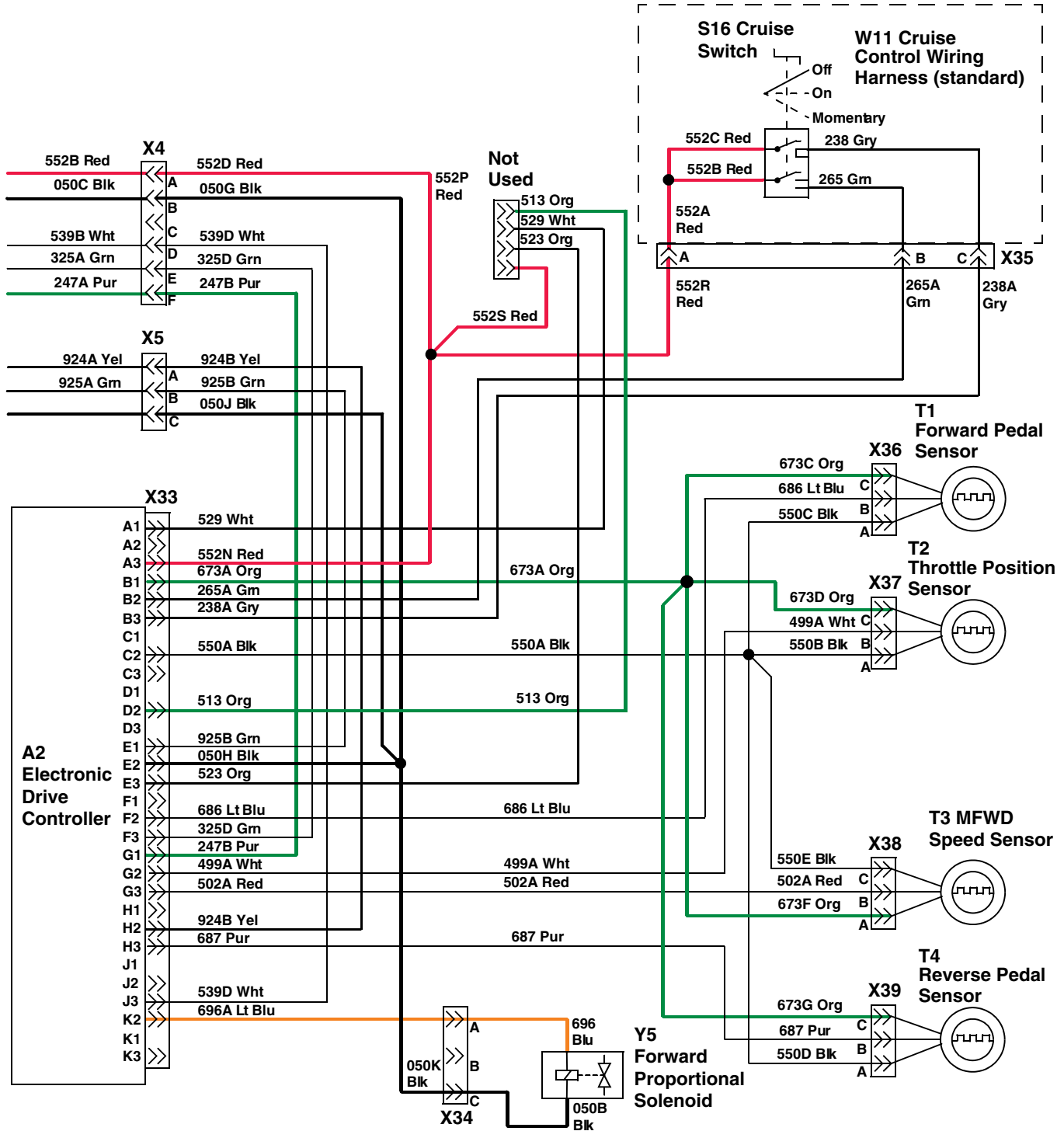
X9—W1 Main Wiring Harness to
S11 Transmission Neutral
Switch (PRT), W4 Jumper
Plug (eHydro™)
X10—W1 Main Wiring Harness
to A1 Display Panel

X11—W1 Main Wiring Harness
to A1 Display Panel

eHydro is a trademark of Deere & Company

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KN52281,10043BB -19-23OCT12-2/4



LVAL12060—UN—17NOV10

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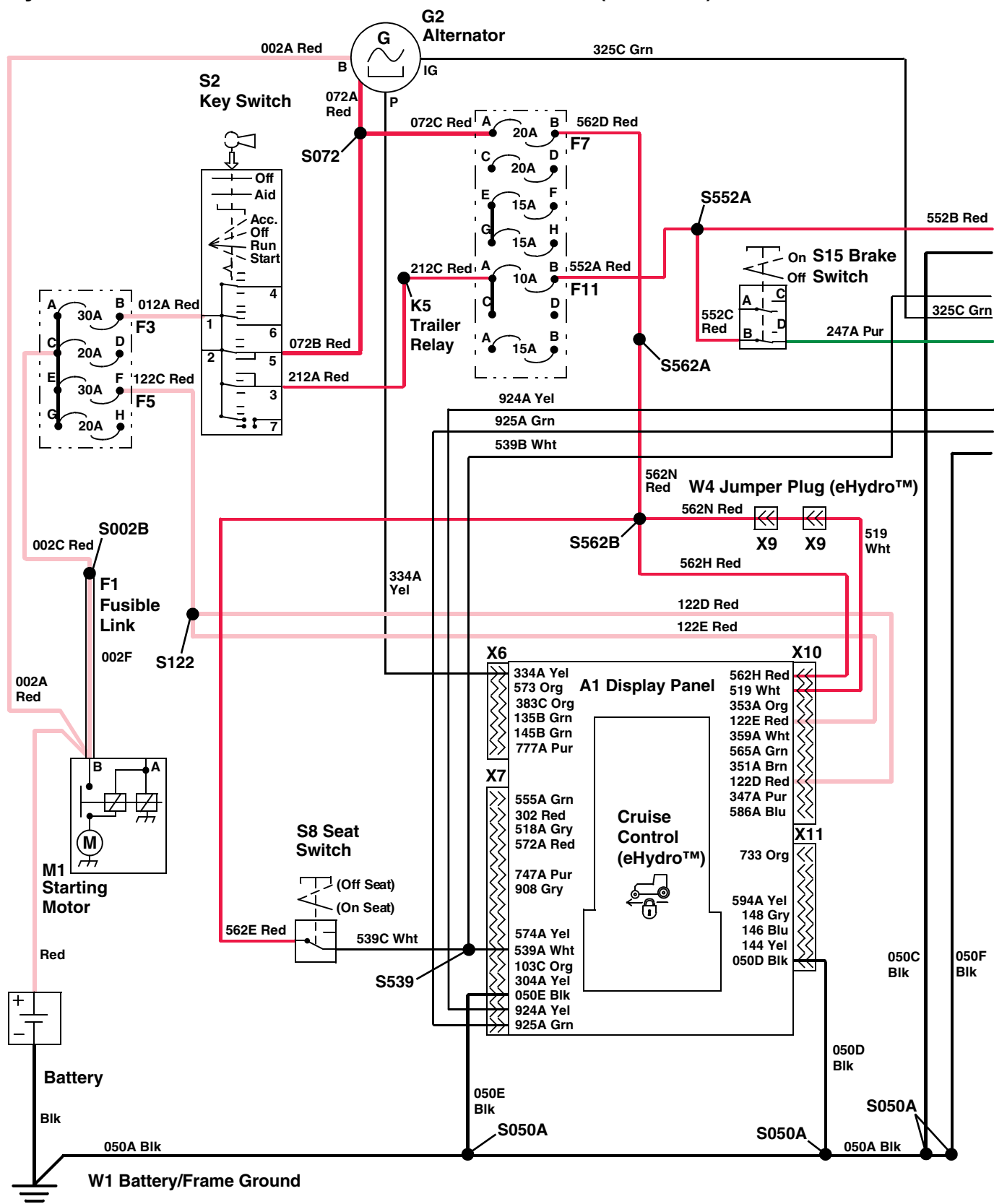
KN52281,10043BB -19-23OCT12-3/4

A2—Electronic Drive Controller	X5—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X36— W9 eHydro™ Wiring Harness to T1 Forward Pedal Sensor	Y5—Forward Proportional Solenoid
S16— Cruise Switch			
T1— Forward Pedal Sensor			
T2— Throttle Position Sensor	X33— W9 eHydro™ Wiring Harness to A2 Electronic Drive Controller	X37— W9 eHydro™ Wiring Harness to T2 Throttle Position Sensor	
T3— Speed Sensor			
T4— Reverse Pedal Sensor	X34— W9 eHydro™ Wiring Harness to W10 Proportional Valve Wiring Harness	X38— W9 eHydro™ Wiring Harness to T3 MFWD Speed Sensor	
W11—Cruise Control Wiring Harness (standard)			
X4—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X35— W9 eHydro™ Wiring Harness to W11 Cruise Control Wiring Harness (standard)	X39— W9 eHydro™ Wiring Harness to T4 Reverse Pedal Sensor	

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KN52281,10043BB -19-23OCT12-4/4

eHydro™—Cruise Control Circuit Electrical Schematic (Standard)—MY13



LVAL38902 —UN—15JAN13

Continued on next page

KN52281,10043D8 -19-10JAN13-1/4

A1—Display Panel
F1—Fusible Link
F3—Fuse 30A
F5—Fuse 30A
F7—Fuse 20A
F11—Fuse 10A
G1—Battery
G2—Alternator
M1—Starting Motor

S2—Key Switch
S8—Seat Switch
S15—Brake Switch
W1—Battery/Frame Ground
W4—Jumper Plug
X6—W1 Main Wiring Harness to
A1 Display Panel

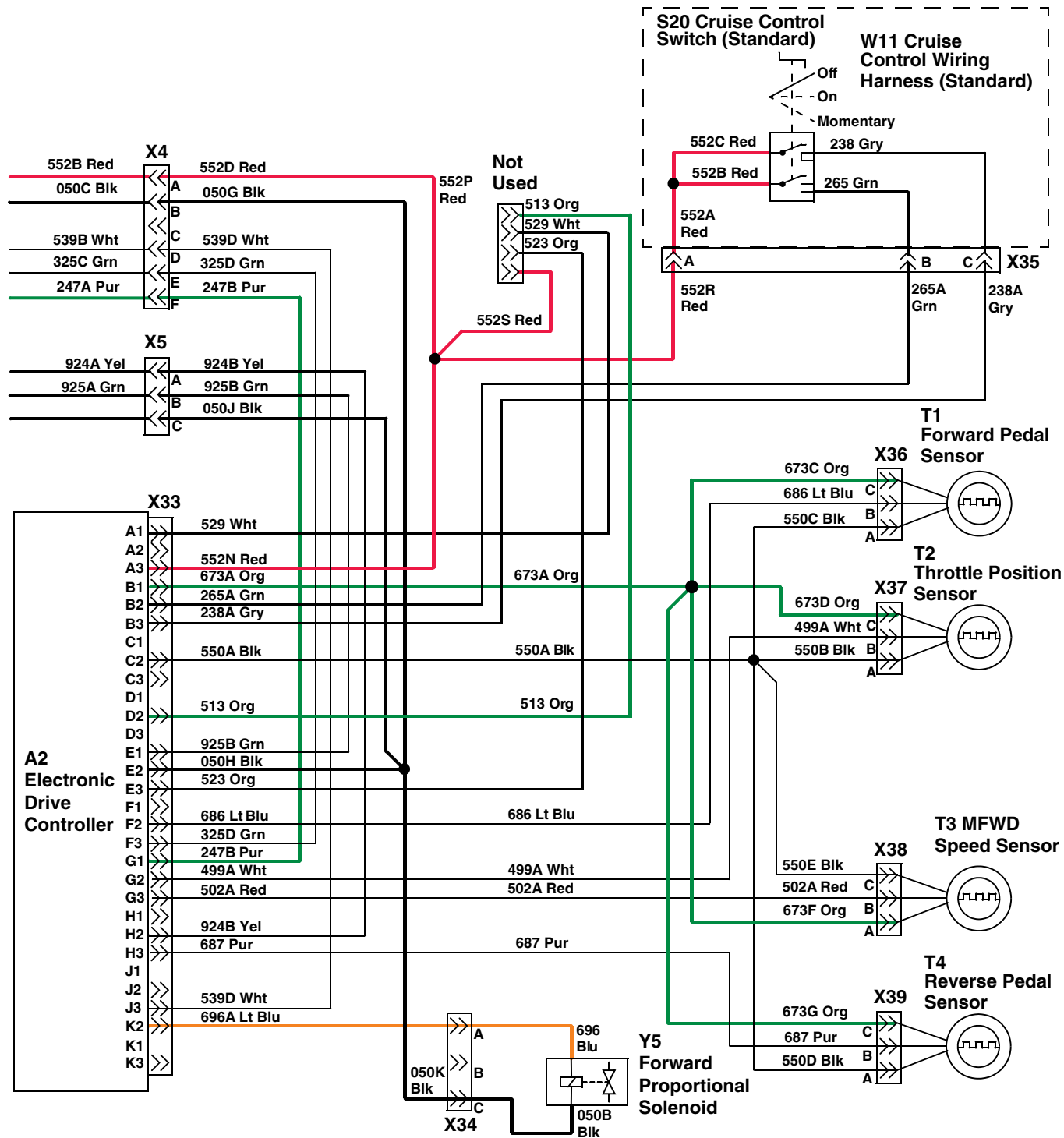
X7—W1 Main Wiring Harness to
A1 Display Panel
X9—W1 Main Wiring Harness to
S11 Transmission Neutral
Switch (PRT), W4 Jumper
Plug (eHydro™)

X10—W1 Main Wiring Harness
to A1 Display Panel
X11—W1 Main Wiring Harness
to A1 Display Panel

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KN52281,10043D8 -19-10JAN13-2/4



LVAL38903—UN—15JAN13

Continued on next page

KN52281,10043D8 -19-10JAN13-3/4

A2—Electronic Drive Controller
S20—Cruise Control Switch (standard)
T1—Forward Pedal Sensor
T2—Throttle Position Sensor
T3—MFWD Speed Sensor
T4—Reverse Pedal Sensor
W11—Cruise Control Wiring Harness (standard)

X4—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness
X5—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness
X33—W9 eHydro™ Wiring Harness to A2 Electronic Drive Controller

X34—W9 eHydro™ Wiring Harness to W10 Proportional Valve Wiring Harness
X35—W9 eHydro™ Wiring Harness to W11 Cruise Control Wiring Harness (standard)
X36—W9 eHydro™ Wiring Harness to T1 Forward Pedal Sensor
X37—W9 eHydro™ Wiring Harness to T2 Throttle Position Sensor

X38—W9 eHydro™ Wiring Harness to T3 MFWD Speed Sensor
X39—W9 eHydro™ Wiring Harness to T4 Reverse Pedal Sensor
Y5—Forward Proportional Solenoid

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KN52281,10043D8 -19-10JAN13-4/4

eHydro™—Cruise Control Circuit Diagnosis (Standard)

Test Procedure A

NOTE: Test forward and reverse drive function before testing the cruise control function. Correct all drive function faults before beginning cruise control diagnostics.

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on

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eHydro™ models. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.) and follow Diagnostic Mode 2 (eHydro/Auto HST).

Test Conditions:

- Park brake locked.
- Right brake pedal released.
- X33 connector to drive controller disconnected.
- Key switch in run position, engine not running.

KN52281,10043BC -19-23OCT12-1/9

Cruise Control Circuit

KN52281,10043BC -19-23OCT12-2/9

Step 1

Do any fault codes appear in the LCD display?

YES: Correct the possible faults. (See [Display Panel Fault Code Chart](#) in Section 50, Group 30.)
NO: Go to next step.

KN52281,10043BC -19-23OCT12-3/9

Step 2

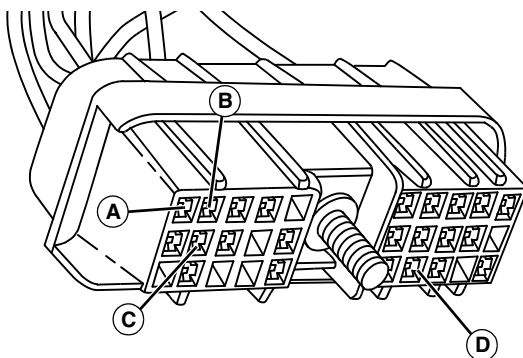
Does machine drive using normal foot pedal operation?

YES: Verify cruise control instructions. See Operators Manual. Go to next step.
NO: Correct the forward and/or reverse circuit operations.

Continued on next page

KN52281,10043BC -19-23OCT12-4/9

Step 3



LVAL12061 —UN—17NOV10

A—X33 Connector Terminal A3, 552 Red Wire
B—X33 Connector Terminal B3, 238 Gry Wire
C—X33 Connector Terminal B3, 238 Gry Wire
D—X33 Connector Terminal G1, 247 Pur Wire

Disconnect the X33 connector to the drive controller. Is battery voltage present at terminal A3, 552 Red wire (A)?

YES: Go to next step.

NO: Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

KN52281,10043BC -19-23OCT12-5/9

Step 4

Is voltage present at terminal G1, 247 Pur wire (D)?

YES: Check that park brake is off. Test the brake switch. (See [Brake and Park Brake Switch Test](#) in Section 40, Group 40.) Check the 247 Pur wire and connections.

NO: Go to next step.

KN52281,10043BC -19-23OCT12-6/9

Step 5

Place cruise control switch in the on position. Is battery voltage present at terminal B3, 238 Gry wire (B)?

YES: Go to next step.

NO: Test the cruise control switch. (See [Cruise/Max Speed Switch Test—eHydro™/Auto HST](#) in Section 40, Group 40.) Check the 238 Gry wire and connections.

KN52281,10043BC -19-23OCT12-7/9

Step 6

Place cruise control switch in the momentary on position. Is battery voltage present at terminal B3, 238 Gry wire (C) and terminal B2, 265 Grn wire (D)?

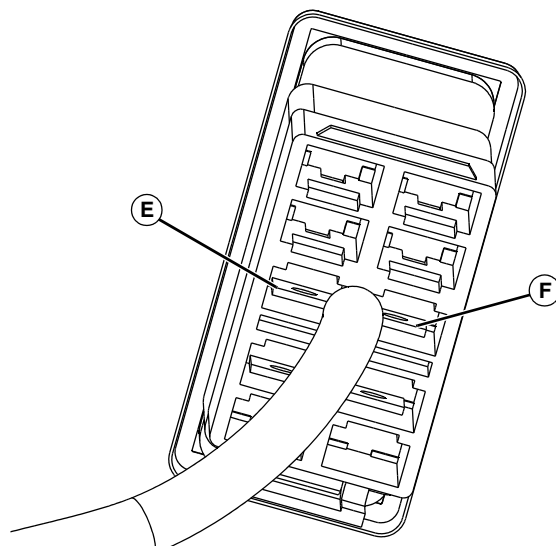
YES: Connect the X33 connector to the drive controller. If all the inputs in steps 3 through 6 are correct and the cruise control function does not operate, replace the drive controller.

NO: Test the cruise control switch. Check the 265 Grn wire and connections.

Continued on next page

KN52281,10043BC -19-23OCT12-8/9

Step 7



LVAL12062 —UN—17NOV10

E—Cruise Control Switch 552B Red
F—Cruise Control Switch 552C Red

Is battery voltage present at the 552B Red (E) and 552C Red (F) wires to the cruise switch?

YES: If normal drive operates, but, cruise control does not, replace drive controller.

NO: Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

KN52281,10043BC -19-23OCT12-9/9

eHydro™—Cruise Control Circuit Operation (Option)

Function:

To control the machine's forward drive speed at a constant speed without having to use the forward drive pedal, and to incrementally increase or decrease the ground speed using the Res/+, Set/- switch. In addition, a stored travel speed can be returned to by pressing the Res/+ if travel speed was momentarily reduced by using the brake pedal.

Operating Conditions:

- Key switch in run position,
- Engine running,
- Operator on seat,
- Park brake unlocked,
- Cruise switch on,
- Forward pedal pressed to desired speed while setting the drive speed, and
- Set/- switch pressed momentarily when the desired drive speed is attained.

The cruise control will remain engaged until the right brake is depressed; the key switch is turned to the off position; or, the cruise control switch is placed into the off position.

Theory of Operation:

The optional cruise control functions in the same manner as the standard cruise control with the added ability to vary the speed using the cruise control switch. (See eHydro™—Cruise Control Circuit Operation (Standard) in Section 50, Group 35.) for the basic cruise control function.

Switched power is provided to the cruise/max speed switch from the key switch, 212 Red wires, F11 fuse, and the 552 Red wires in the W1 main wiring harness, X4 connector, 552 Red wires in the W9 eHydro™ wiring harness, X35 connector, and the 552A and 552C Red wires in the W12 cruise control wiring harness.

The Res/+, Set/- switch receives power from the switched power circuit on 552A and 552B Red wires.

When the cruise/max speed switch is in the on position current is provided from the 552C Red wire across the switch to the 238 Gry wire of the W12 and W9 wiring harnesses to the A2 drive controller (terminal B3). This input, turns on the logic circuit used to enable the cruise control function.

The next input signal needed to activate the cruise circuit is an input from the forward pedal sensor on wire 686 Lt Blu (terminal F2). This circuit causes an output on the 696

Blu wire (terminal K2) to the forward proportional solenoid which in turn causes the machine to move forward.

Once the machine is traveling at the desired speed, momentarily pressing the Res/ +, Set/—switch to the Set/- position supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller (terminal B2). This input will set the cruise speed at the speed being traveled.

At the moment the Set/- switch is pressed the drive controller records the inputs from the forward pedal sensor, alternator, throttle position sensor, and the MFWD speed sensor. The drive controller then supplies an output current to the forward proportional solenoid to maintain the speed recorded at the MFWD speed sensor (terminal G3).

The cruise speed setting can be increased and decreased while the machine is being driven by momentarily pressing either the Res/+ switch to increase the cruise speed or the Set/- switch to decrease the cruise speed setting.

Pressing Res/+, or Set/- positions of the switch to change the cruise speed setting will become effective immediately without returning to neutral. The increase/decrease amount is a percentage of the actual machine speed.

Pressing the Res/+ side of the switch supplies power from the 552B Red wire across the switch to the 266 Blu wire to the drive controller (terminal J2). Pressing the Set/- side of the switch supplies power from the 552B Red wire across the switch to the 265 Grn wire to the drive controller (terminal B2).

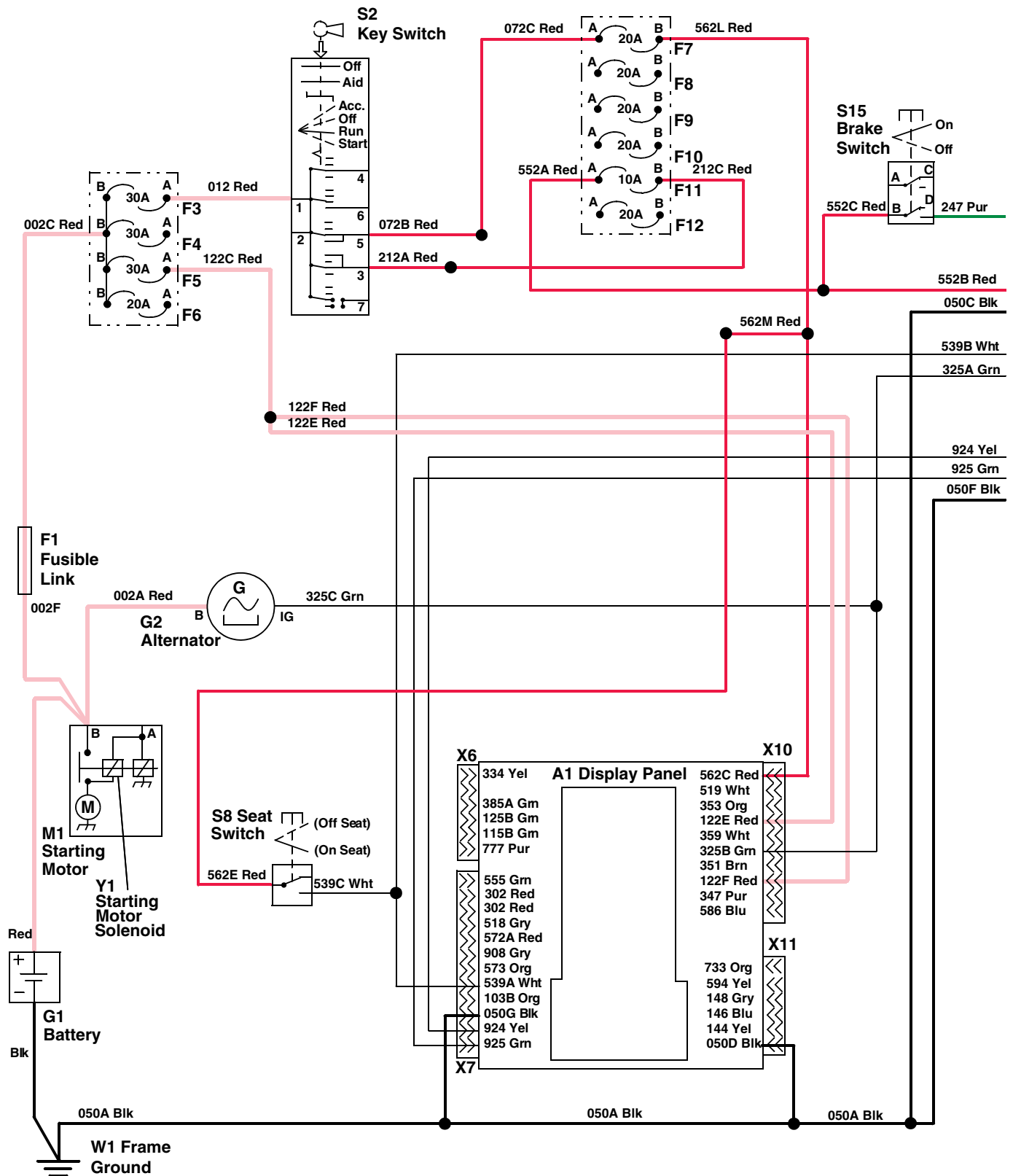
Pressing either the right brake or reverse pedals will disengage the cruise function. The last speed setting is stored in the drive controller and if the operator is pressing the forward pedal, the Res/+ switch can be pressed momentarily to ramp back to the stored speed. Turning the cruise switch off, will disengage the cruise function and erase the stored setting.

If changes in machine loading or range gear position settings do not allow for return to the previous speed setting, the drive controller will attempt to return to the speed setting by sending either the maximum (fastest speed possible) or minimum (slowest speed possible) current to the forward proportional solenoid. If the machine is driving either up or down a grade, the drive controller will increase or decrease the output current to the forward proportional solenoid to maintain the speed at the MFWD speed sensor. If the operator changes the throttle position, the drive controller will again vary the output to the forward proportional solenoid to maintain the drive speed at the MFWD speed sensor.

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KN52281,10043BD -19-23OCT12-1/1

eHydro™—Cruise Control Circuit Electrical Schematic (Option)—Pre MY08



LVAL12063 —UN—17NOV10

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KN52281,10043BE -19-01NOV12-1/4

A1—Display Panel
F1— Fusible Link
F3— Fuse 30A
F4— Fuse 30A
F5— Fuse 30A
F6— Fuse 20A
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A

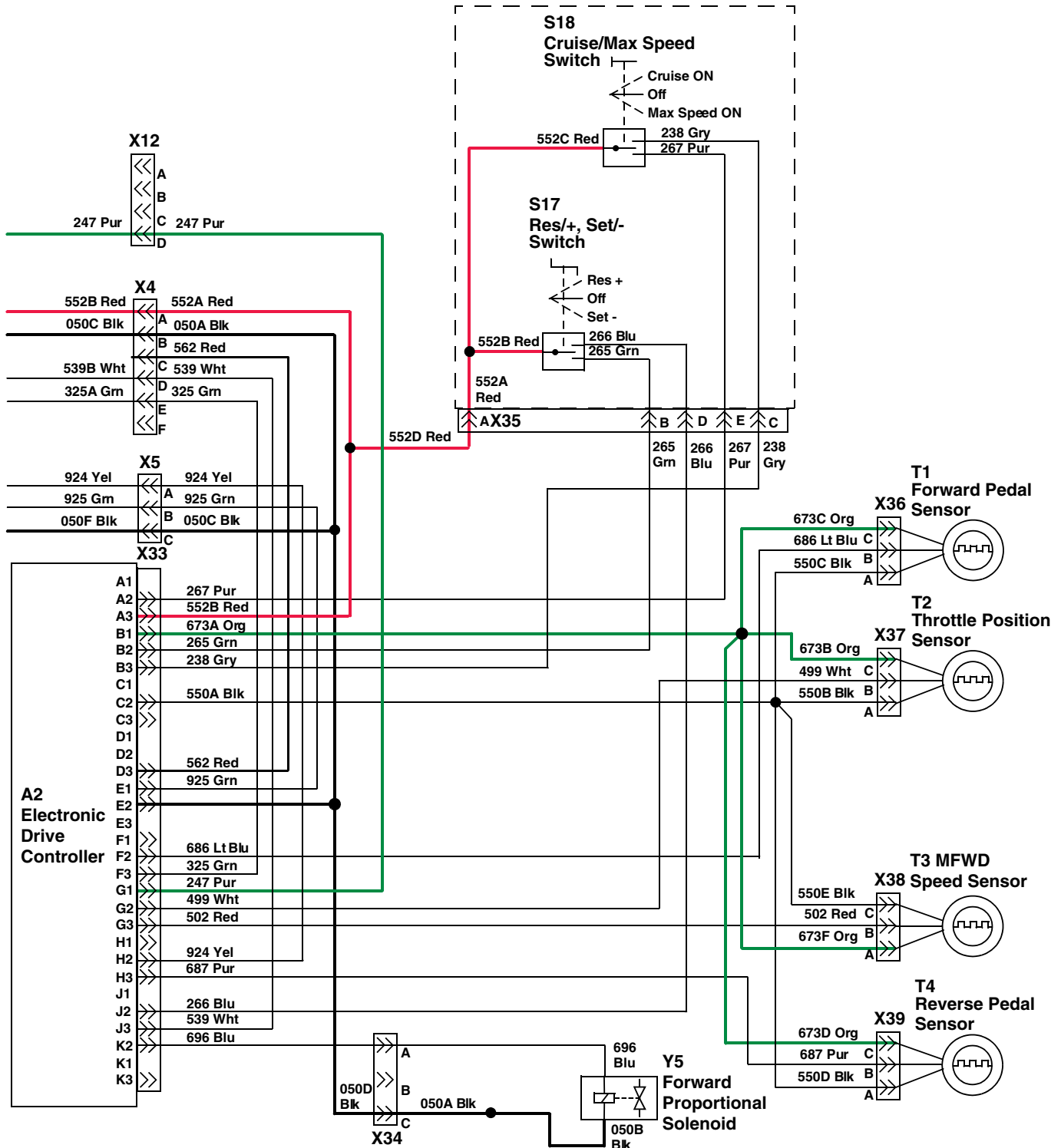
F10— Fuse 20A
F11— Fuse 10A
F12— Fuse 20A
G1—Battery
G2—Alternator
M1—Starting Motor
S2— Key Switch
S8— Seat Switch
S15— Brake Switch

W1—Frame Ground
X6— W1 Main Wiring Harness to
A1 Display Panel
X7— W1 Main Wiring Harness to
A1 Display Panel
X10— W1 Main Wiring Harness
to A1 Display Panel

X11— W1 Main Wiring Harness
to A1 Display Panel
Y1— Starting Motor Solenoid

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KN52281,10043BE -19-01NOV12-2/4



LVAL12064—UN—17NOV10

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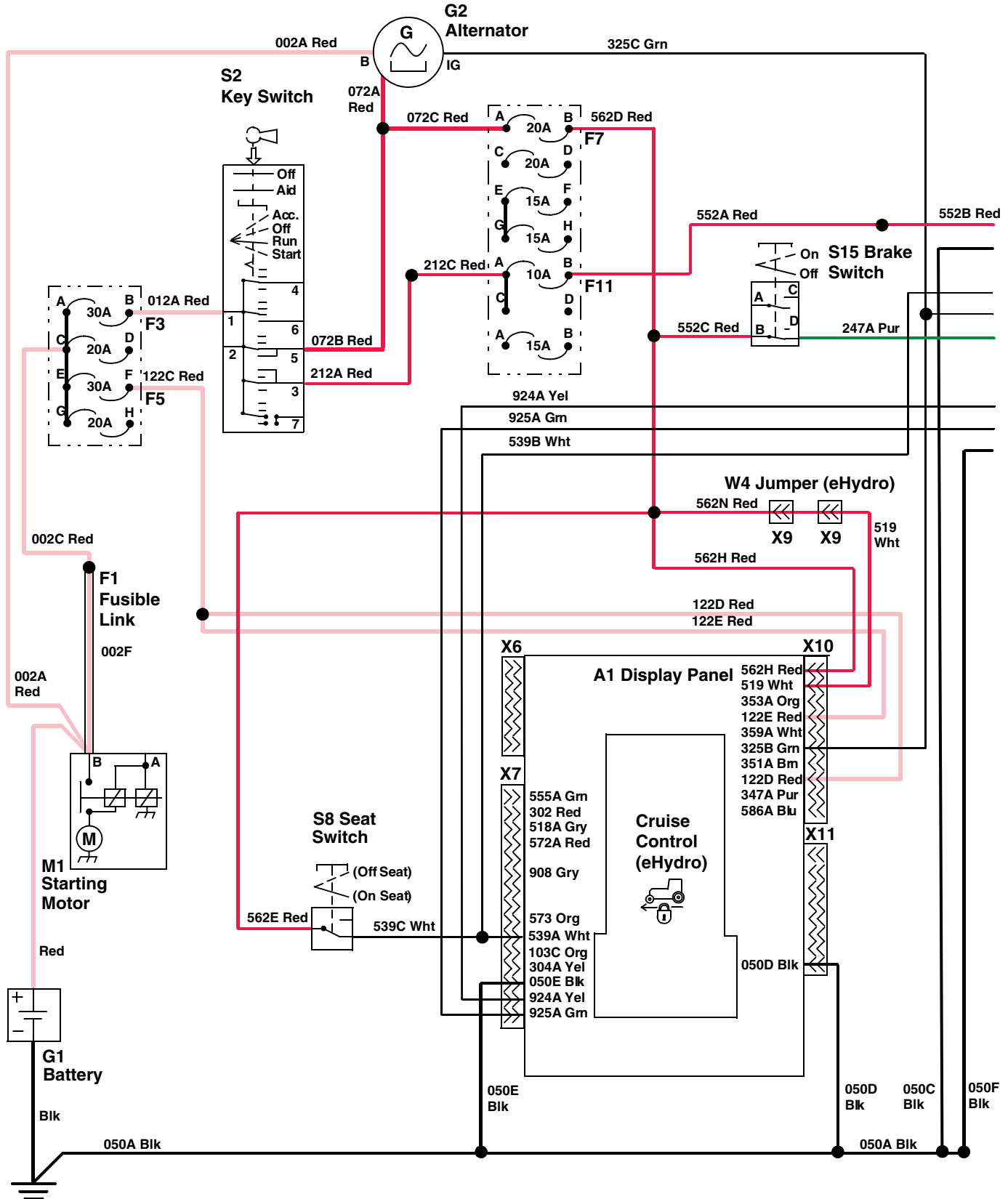
KN52281,10043BE -19-01NOV12-3/4

A2—Electronic Drive Controller	X4—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X34— W9 eHydro™ Wiring Harness to W10 Proportional Valve Wiring Harness	X38— W9 eHydro™ Wiring Harness to T3 MFWD Speed Sensor
S17— Res/+, Set/- Switch (optional)	X5—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X35— W9 eHydro™ Wiring Harness to W12 Cruise Control Wiring Harness (optional)	X39— W9 eHydro™ Wiring Harness to T4 Reverse Pedal Sensor
S18— Cruise Control/Max Speed Switch (optional)	X12— W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X36— W9 eHydro™ Wiring Harness to T1 Forward Pedal Sensor	
T1— Forward Pedal Sensor	X33— W9 eHydro™ Wiring Harness to A2 Electronic Drive Controller	X37— W9 eHydro™ Wiring Harness to T2 Throttle Position Sensor	
T2— Throttle Position Sensor			
T3— Speed Sensor			
T4— Reverse Pedal Sensor			
Y5— Forward Proportional Solenoid			

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KN52281,10043BE -19-01NOV12-4/4

eHydro™—Cruise Control Circuit Electrical Schematic (Option)—MY08



LVAL12065 —UN—17NOV10

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KN52281,10043BF -19-23OCT12-1/4

A1—Display Panel
F1—Fusible Link
F3—Fuse 30A
F5—Fuse 30A
F7—Fuse 20A
F11—Fuse 10A
G1—Battery
G2—Alternator
M1—Starting Motor

S2—Key Switch
S8—Seat Switch
S15—Brake Switch
W4—Jumper Plug (eHydro™)
X6—W1 Main Wiring Harness to
A1 Display Panel
X7—W1 Main Wiring Harness to
A1 Display Panel

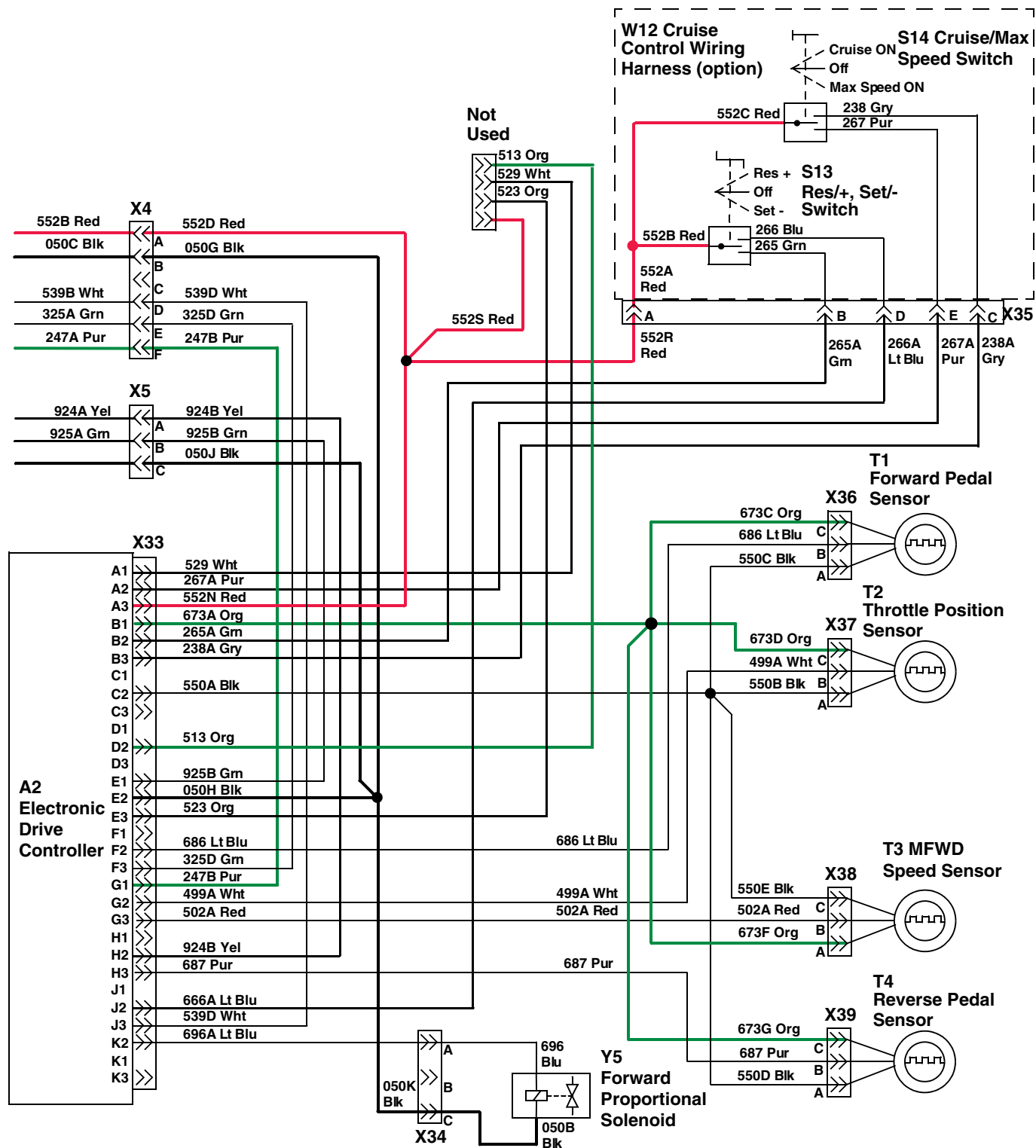
X9—W1 Main Wiring Harness to
S11 Transmission Neutral
Switch (PRT), W4 Jumper
Plug (eHydro™)
X10—W1 Main Wiring Harness
to A1 Display Panel

X11—W1 Main Wiring Harness
to A1 Display Panel

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KN52281,10043BF -19-23OCT12-2/4



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KN52281,10043BF -19-23OCT12-3/4

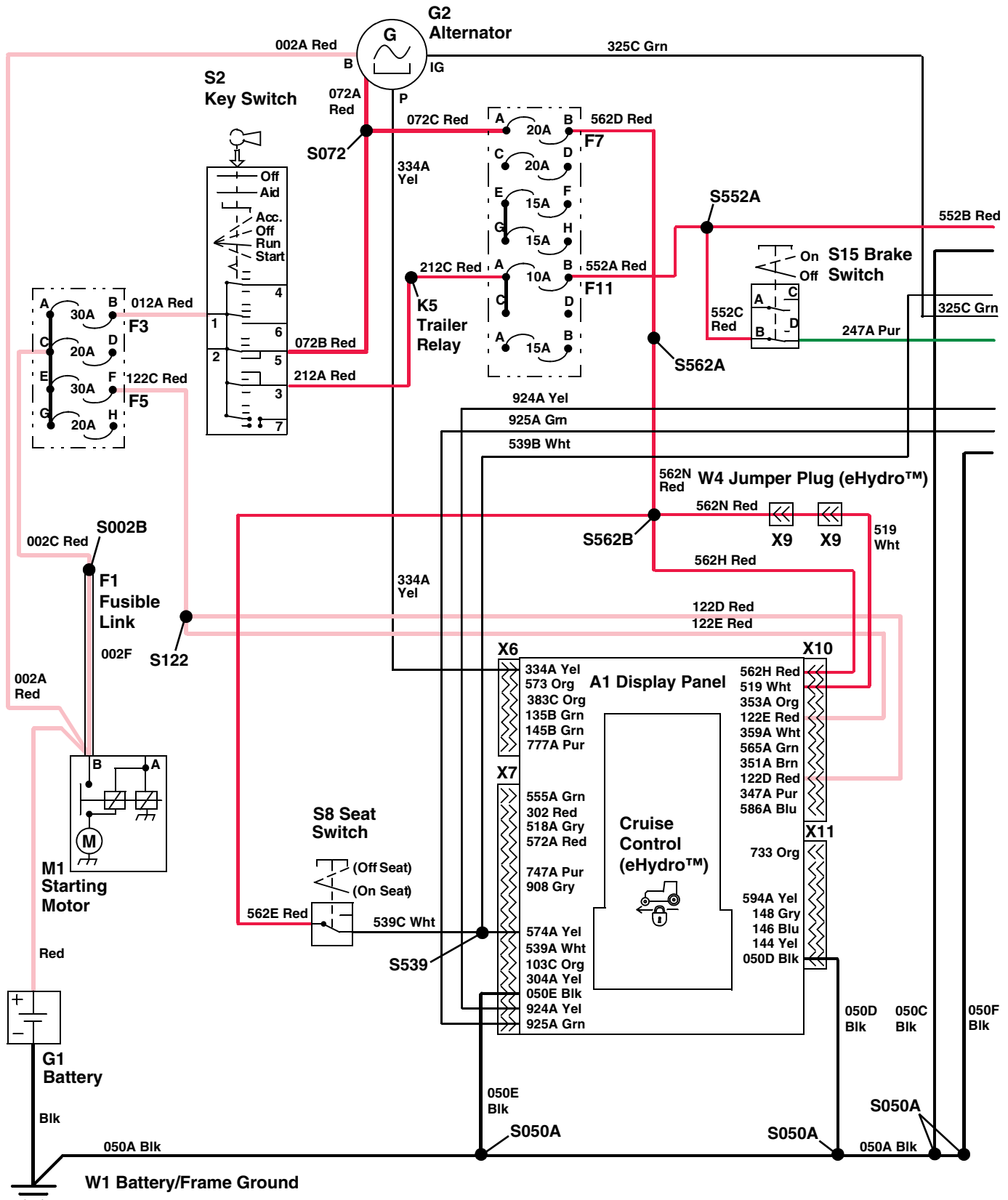
LVAL12066—UN—17NOV10

A2—Electronic Drive Controller	X4—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X35— W9 eHydro™ Wiring Harness to W11 Cruise Control Wiring Harness (standard)	X39— W9 eHydro™ Wiring Harness to T4 Reverse Pedal Sensor
S13— Res/+, Set/- Switch (optional)	X5—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X36— W9 eHydro™ Wiring Harness to T1 Forward Pedal Sensor	Y5— Forward Proportional Solenoid
S14— Cruise Control/Max Speed Switch (optional)	X33— W9 eHydro™ Wiring Harness to A2 Electronic Drive Controller	X37— W9 eHydro™ Wiring Harness to T2 Throttle Position Sensor	
T1— Forward Pedal Sensor	X34— W9 eHydro™ Wiring Harness to W10 Proportional Valve Wiring Harness	X38— W9 eHydro™ Wiring Harness to T3 MFWD Speed Sensor	
T2— Throttle Position Sensor			
T3— Speed Sensor			
T4— Reverse Pedal Sensor			
W12—Cruise Control Wiring Harness (option)			

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KN52281,10043BF -19-23OCT12-4/4

eHydro™—Cruise Control Circuit Electrical Schematic (Option)—MY13



LVAL38904 —UN—15JAN13

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KN52281,10043D9 -19-10JAN13-1/4

A1—Display Panel
F1— Fusible Link
F3— Fuse 30A
F5— Fuse 30A
F7— Fuse 20A
F11— Fuse 10A
G1—Battery
G2—Alternator
M1—Starting Motor

S2— Key Switch
S8— Seat Switch
S15— Brake Switch
W1—Battery/Frame Ground
W4—Jumper Plug
X6— W1 Main Wiring Harness to
A1 Display Panel

X7— W1 Main Wiring Harness to
A1 Display Panel
X9— W1 Main Wiring Harness to
S11 Transmission Neutral
Switch (PRT), W4 Jumper
Plug (eHydro™)

X10— W1 Main Wiring Harness
to A1 Display Panel
X11— W1 Main Wiring Harness
to A1 Display Panel

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KN52281,10043D9 -19-10JAN13-2/4



KN52281,10043D9 -19-10JAN13-3/4

A2—Electronic Drive Controller	X4—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X35— W9 eHydro™ Wiring Harness to W11 Cruise Control Wiring Harness (standard)	X39— W9 eHydro™ Wiring Harness to T4 Reverse Pedal Sensor
S13— Res/+, Set/- Switch (optional)	X5—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X36— W9 eHydro™ Wiring Harness to T1 Forward Pedal Sensor	Y5— Forward Proportional Solenoid
S14— Cruise Control/Max Speed Switch (optional)	X33— W9 eHydro™ Wiring Harness to A2 Electronic Drive Controller	X37— W9 eHydro™ Wiring Harness to T2 Throttle Position Sensor	
T1— Forward Pedal Sensor	X34— W9 eHydro™ Wiring Harness to W10 Proportional Valve Wiring Harness	X38— W9 eHydro™ Wiring Harness to T3 MFWD Speed Sensor	
T2— Throttle Position Sensor			
T3— MFWD Speed Sensor			
T4— Reverse Pedal Sensor			
W12—Cruise Control Wiring Harness (option)			

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KN52281,10043D9 -19-10JAN13-4/4

eHydro™—Cruise Control Circuit Diagnosis (Option)

Test Procedure A

NOTE: Test forward and reverse drive function before testing the cruise control function. Correct all drive function faults before beginning cruise control diagnostics.

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on

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eHydro™ models. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.) and follow Diagnostic Mode 2 (eHydro/Auto HST).

Test Conditions:

- Park brake locked.
- Right brake pedal released.
- Key switch in run position, engine not running.

KN52281,10043C0 -19-23OCT12-1/11

Cruise/Max Speed Circuit

KN52281,10043C0 -19-23OCT12-2/11

Step 1

Do any fault codes appear in the LCD display?

YES: Correct the possible faults. (See [Display Panel Fault Code Chart](#) in Section 50, Group 30.)
NO: Go to next step.

KN52281,10043C0 -19-23OCT12-3/11

Step 2

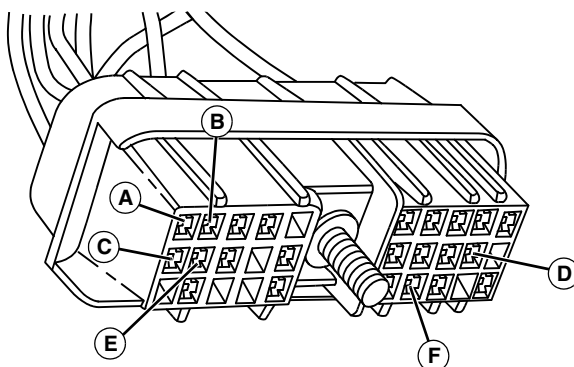
Does machine drive using normal foot pedal operation?

YES: Verify cruise control instructions. See Operators Manual. Go to next step.
NO: Correct the forward and/or reverse circuit operations.

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KN52281,10043C0 -19-23OCT12-4/11

Step 3



LVAL12067 —UN—17NOV10

- A**—X33 Connector Terminal A3, 552 Red Wire
- B**—X33 Connector Terminal B3, 238 Gry Wire
- C**—X33 Connector Terminal A2, 267 Pur Wire
- D**—X33 Connector Terminal J2, 266 Blu Wire
- E**—X33 Connector Terminal B2, 265 Grn Wire
- F**—X33 Connector Terminal G1, 247 Pur Wire

Disconnect the X33 connector to the drive controller. Is battery voltage present at terminal A3, 552 Red wire (A)?

YES: Go to next step.

NO: Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

KN52281,10043C0 -19-23OCT12-5/11

Step 4

Is voltage present at terminal G1, 247 Pur wire (F)?

YES: Check that park brake is off. Test the brake switch. (See [Brake and Park Brake Switch Test](#) in Section 40, Group 40.) Check the 247 Pur wire and connections.

NO: Go to next step.

KN52281,10043C0 -19-23OCT12-6/11

Step 5

Place cruise/max speed switch in the cruise on position. Is battery voltage present at terminal B3, 238 Gry wire (B)?

YES: Go to next step.

NO: Test the cruise/max speed switch. (See [Cruise/Max Speed Switch Test—eHydro™/Auto HST](#) in Section 40, Group 40.) Check the 238 Gry wire and connections.

KN52281,10043C0 -19-23OCT12-7/11

Step 6

Place cruise/max speed switch in the max speed on position. Is battery voltage present at terminal A2, 267 Pur wire (C)?

YES: Go to next step.

NO: Test the cruise/max speed switch. (See [Cruise/Max Speed Switch Test—eHydro™/Auto HST](#) in Section 40, Group 40.) Check the 267 Pur wire and connections.

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KN52281,10043C0 -19-23OCT12-8/11

Step 7

Press and hold the Res/+, Set/- switch in the Res/+ position during the test. Is battery voltage present at terminal J2, 266 Blu wire (D)?

YES: Go to next step.

NO: Test the Res/+, Set/- speed switch. (See [Res/+, Set/- Switch Test—eHydro™/Auto HST](#) in Section 40, Group 40.) Check the 266 Blu wire and connections.

KN52281,10043C0 -19-23OCT12-9/11

Step 8

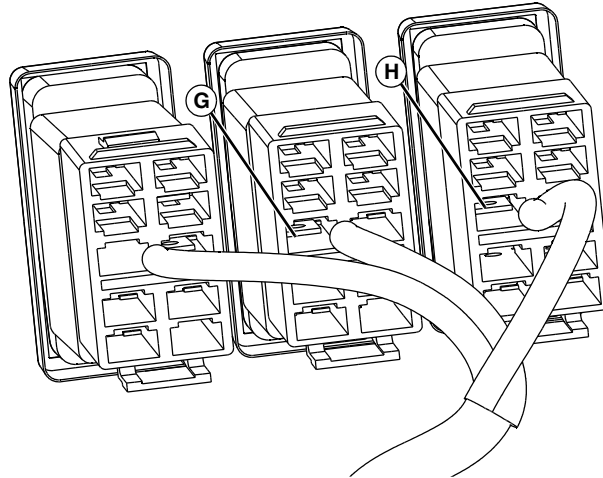
Press and hold the Res/+, Set/- switch in the Set/- position during the test. Is battery voltage present at terminal B2, 265 Grn wire (E)?

YES: Connect the X33 connector to the drive controller. If all the inputs in steps 3 through 8 are correct and the cruise control or max speed functions do not operate, replace the drive controller.

NO: Test the Res/+, Set/- speed switch. (See [Res/+, Set/- Switch Test—eHydro™/Auto HST](#) in Section 40, Group 40.) Check the 265 Grn wire and connections.

KN52281,10043C0 -19-23OCT12-10/11

Step 9



LVAL12068 —UN—17NOV10

G—552B Red Wire
H—552C Red Wire

Is battery voltage present at the 552B Red (G) and 552C Red (H) wires?

YES: If normal drive operates, but, cruise control or max speed do not, replace drive controller.

NO: Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

KN52281,10043C0 -19-23OCT12-11/11

eHydro™—Load Match and Motion Match Circuit Operation

Function, Load Match:

To prevent the engine from stalling during heavy loading situations.

Operating Conditions, Load Match:

- Key switch in run position
- Engine running
- Operator on seat
- Park brake unlocked
- Load match switch in the on position
- Machine being driven either forward or reverse

Theory of Operation, Load Match:

Load match is used to eliminate operators stalling the engine during a typical application such as loader work. A throttle position sensor is installed to read the no-load engine rpm set point.

If the engine rpm drops far enough below the set point value, the current sent to the transmission drive valve coils is reduced to allow the engine to recover. The greater the load on the engine, the greater the reduction in current.

If cruise control is active and the load match comes on, the ground speed is stored at the speed it is currently operating at. The load match reduces current to the proportional drive valve and speed is reduced until the load is removed and the load match goes back to 100%. The cruise control will then increase the current output to the proportional valve until the stored ground speed is obtained.

The load match switch can be turned on or off to allow the operator to disable the load match function if desired.

The load match feature will have no effect if the machine is not being driven when the stalling load is being placed on the engine.

Switched power is provided to the load match switch from the key switch, 212 Red wires, F11 fuse, and 552 Red wires in the W1 main wiring harness, X4 connector, 552 Red wires in the W9 eHydro™ wiring harness, X35 connector, and the 552A and 552C Red wires in the W12 cruise control wiring harness.

When the load match switch is in the on position, power is supplied from the 552E Red wire, across the load match switch to the 268 Gry wire to the drive controller (terminal H1). This enables the load match function to prevent the engine stalling during heavy load applications.

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Function, Motion Match:

To allow the operator to change how quickly the pedals respond to being pressed or released.

Operating Conditions, Motion Match:

- Key switch in run position
- Engine running
- Operator on seat
- Park brake unlocked
- Motion match switch in the on position
- Machine being driven either forward or reverse

Theory of Operation, Motion Match:

Motion Match enables the operator to adjust machine acceleration and deceleration rates.

The rate of acceleration and deceleration is controlled by the drive controller to smoothly ramp the speed up and down. Two different settings provide for either quicker or slower acceleration or deceleration. This operation is controlled by the operator placing the motion match switch in either the on or off position. The change in this setting will take effect as soon as the switch is changed.

Placing the motion match switch in the on position will give the transmission higher response sensitivity to drive pedal movement. Shorter starting and stopping distances can be set for applications requiring rapid changes in direction, such as operating with a loader.

Placing the motion match switch in the off position will give the drive pedals the sensitivity that is typical to most normal operating conditions. Longer starting and stopping distances can be set to avoid turf damage in other applications.

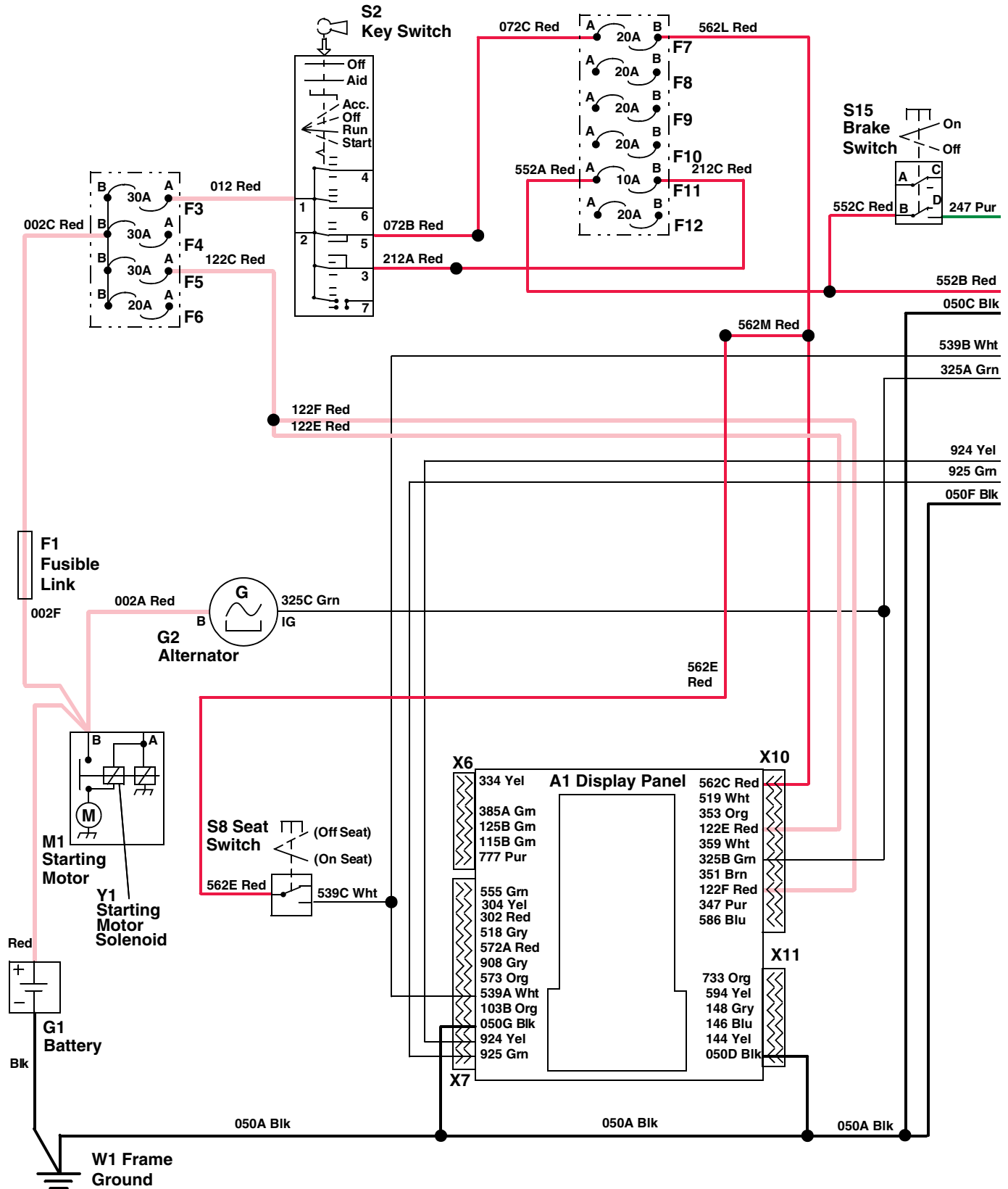
Current is supplied to the A2 electronic drive controller (drive controller) from the switched power circuit. With the key switch in the run position, current is supplied to the 212 Red wires, F11 fuse, 552 Red wires, X4 connector of the W9 wiring harness to the 552 Red wires and the X33 connector of the drive controller. This circuit powers the drive controller to allow for drive control operation.

The motion match switch receives secondary switched power from the drive controller on 673A, 673E Org wires, X35, and the 673 Org wire.

When the motion match switch is in the on position, power is supplied from the 673 Org wire, across the motion match switch to the 269 Wht wire to the drive controller (terminal C3). This enables the motion match function for quicker acceleration and deceleration rates.

KN52281,10043C1 -19-23OCT12-1/1

eHydro™—Load Match and Motion Match Circuit Electrical Schematic—Pre MY08



LVAL12069 —UN—17NOV10

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KN52281,10043C2 -19-01NOV12-1/4

A1—Display Panel
F1— Fusible Link
F3— Fuse 30A
F4— Fuse 30A
F5— Fuse 30A
F6— Fuse 20A
F7— Fuse 20A
F8— Fuse 20A
F9— Fuse 20A

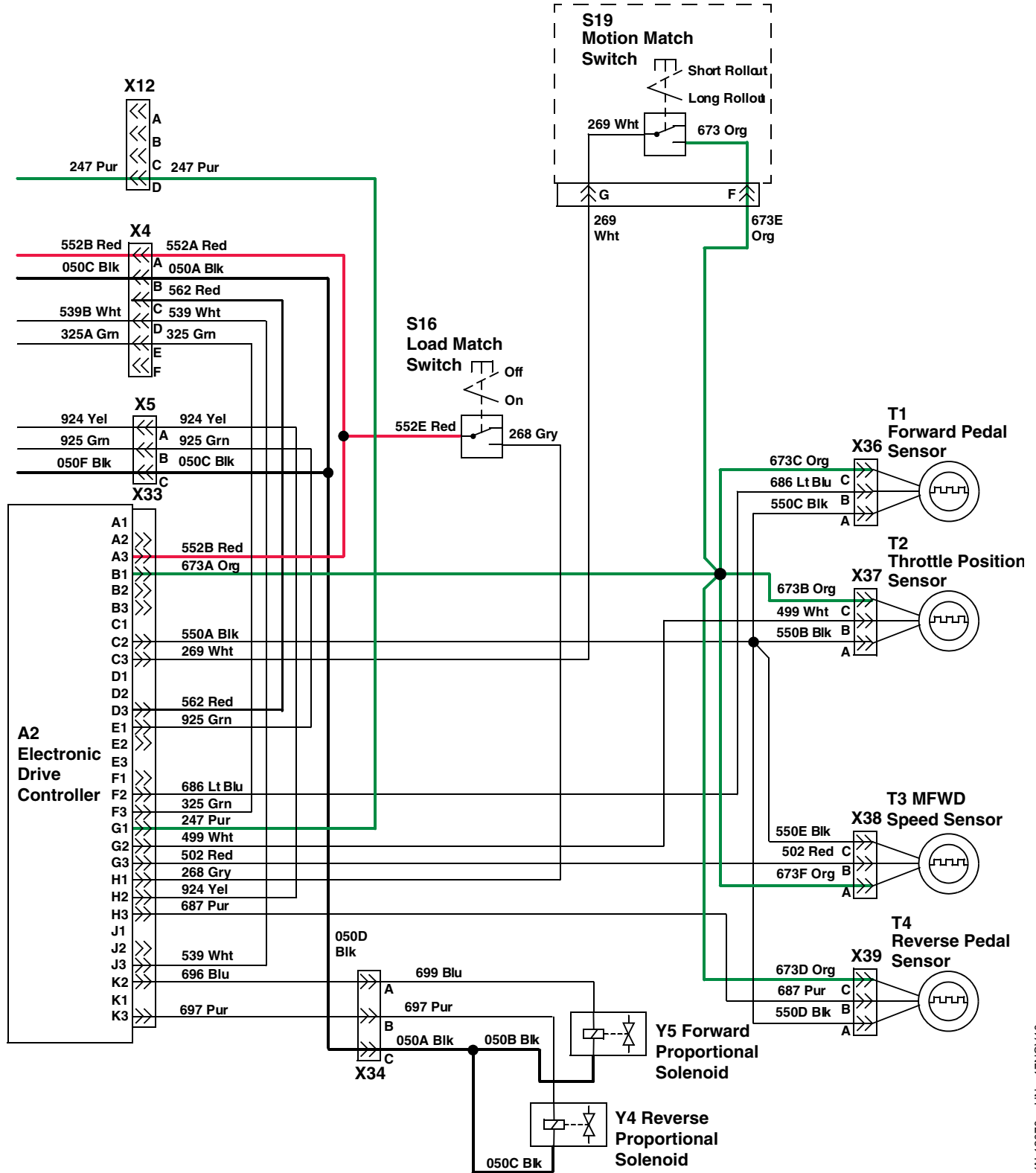
F10— Fuse 20A
F11— Fuse 10A
F12— Fuse 20A
G1—Battery
G2—Alternator
M1—Starting Motor
S2— Key Switch
S8— Seat Switch
S15— Brake Switch

W1—Frame Ground
X6— W1 Main Wiring Harness to
A1 Display Panel
X7— W1 Main Wiring Harness to
A1 Display Panel
X10— W1 Main Wiring Harness
to A1 Display Panel

X11— W1 Main Wiring Harness
to A1 Display Panel
Y1— Starting Motor Solenoid

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KN52281,10043C2 -19-01NOV12-2/4



LVAL12070—UN—17NOV10

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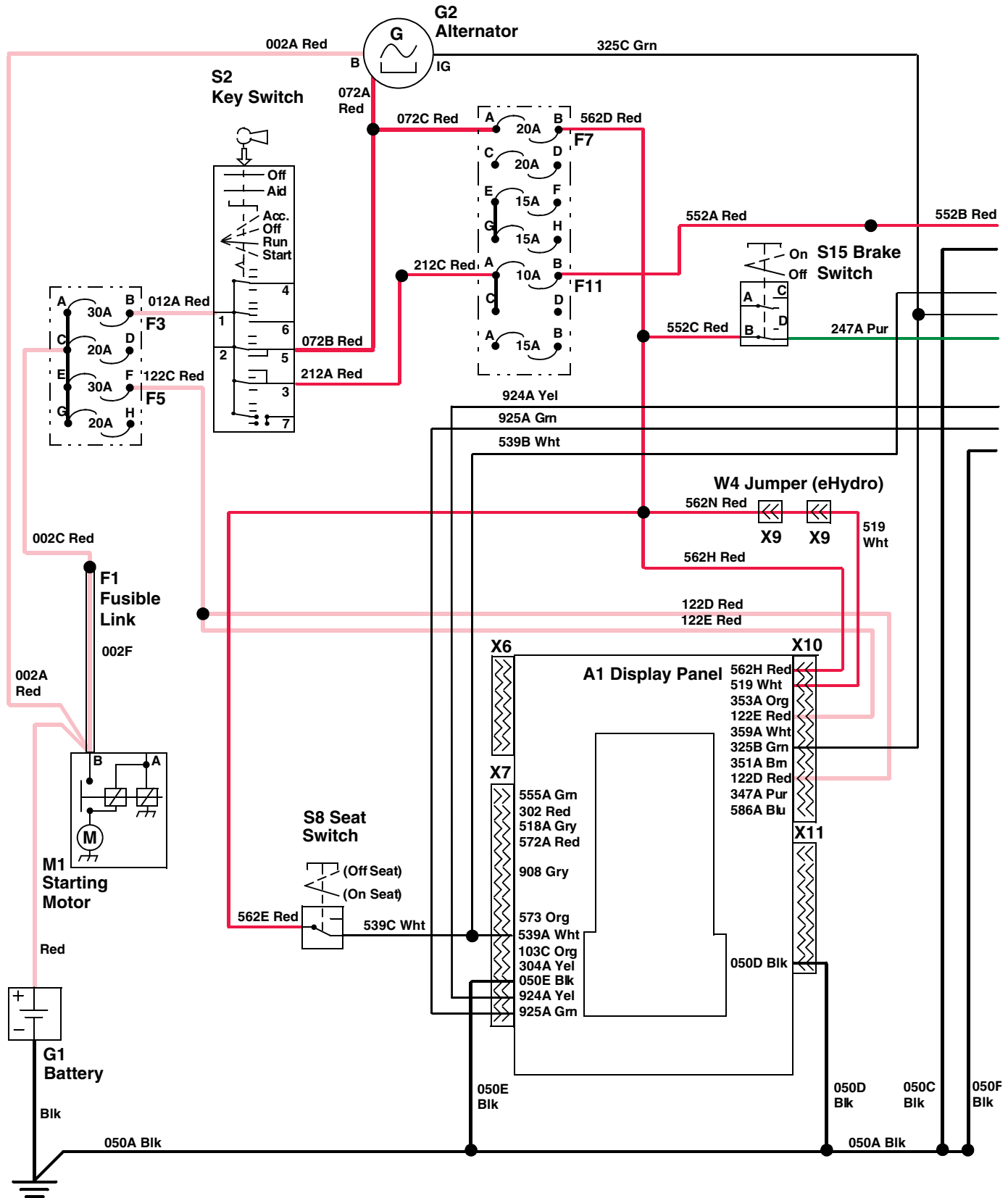
KN52281,10043C2 -19-01NOV12-3/4

A2—Electronic Drive Controller	X5—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X36— W9 eHydro™ Wiring Harness to T1 Forward Pedal Sensor	Y4—Reverse Proportional Solenoid
S16— Load Match Switch			Y5—Forward Proportional Solenoid
S19— Motion Match Switch			
T1— Forward Pedal Sensor	X12— W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X37— W9 eHydro™ Wiring Harness to T2 Throttle Position Sensor	
T2— Throttle Position Sensor			
T3— MFWD Speed Sensor	X33— W9 eHydro™ Wiring Harness to A2 Electronic Drive Controller	X38— W9 eHydro™ Wiring Harness to T3 MFWD Speed Sensor	
T4— Reverse Pedal Sensor			
X4— W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X34— W9 eHydro™ Wiring Harness to W10 Proportional Valve Wiring Harness	X39— W9 eHydro™ Wiring Harness to T4 Reverse Pedal Sensor	

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KN52281,10043C2 -19-01NOV12-4/4

eHydro™—Load Match and Motion Match Circuit Electrical Schematic—MY08



LVAL12071 —UN—17NOV10

Continued on next page

KN52281,10043C3 -19-23OCT12-1/4

A1—Display Panel
F1—Fusible Link
F3—Fuse 30A
F5—Fuse 30A
F7—Fuse 20A
F11—Fuse 10A
G1—Battery
G2—Alternator
M1—Starting Motor

S2—Key Switch
S8—Seat Switch
S15—Brake Switch
W4—Jumper Plug (eHydro™)
X6—W1 Main Wiring Harness to
A1 Display Panel
X7—W1 Main Wiring Harness to
A1 Display Panel

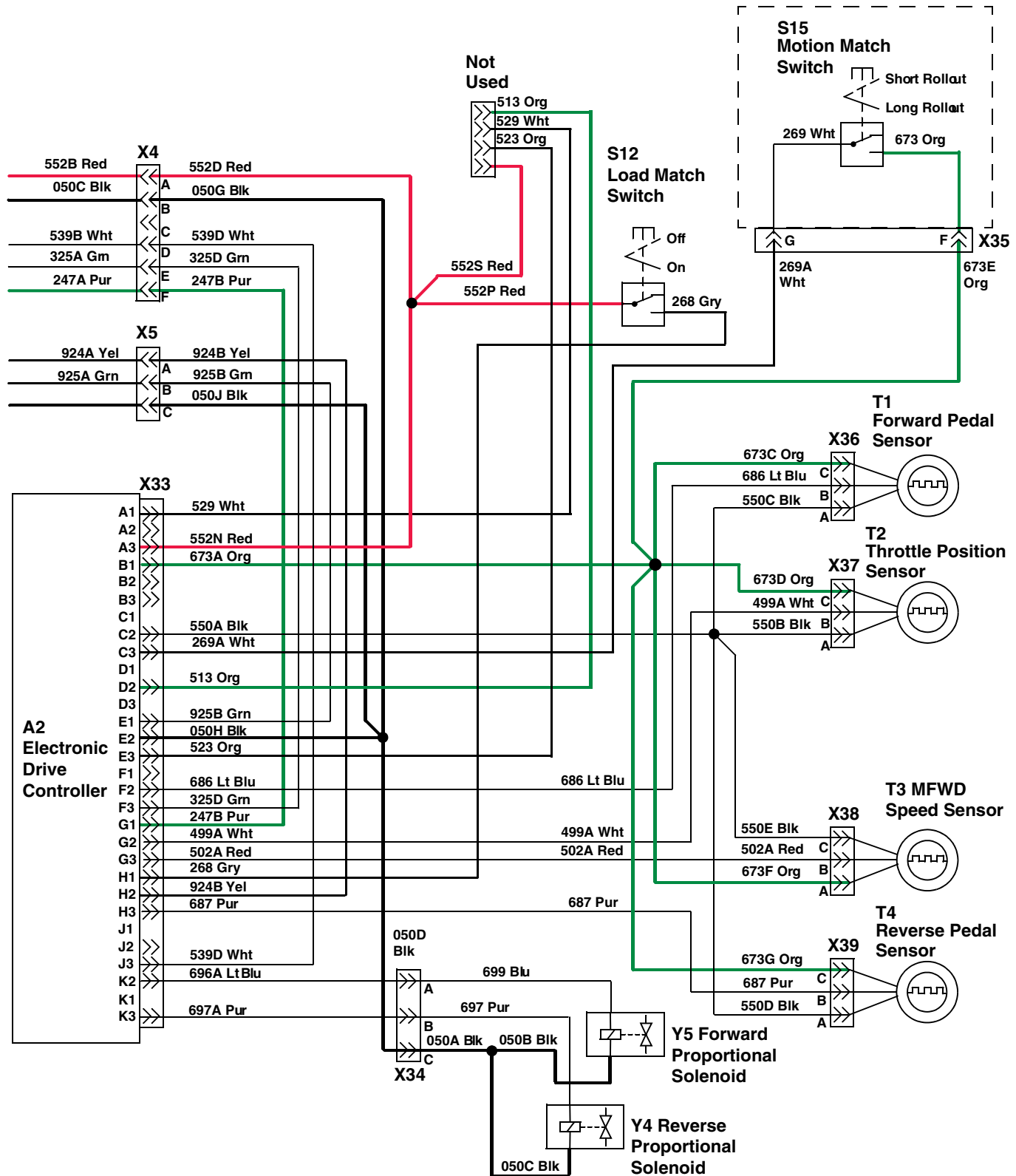
X9—W1 Main Wiring Harness to
S11 Transmission Neutral
Switch (PRT), W4 Jumper
Plug (eHydro™)
X10—W1 Main Wiring Harness
to A1 Display Panel

X11—W1 Main Wiring Harness
to A1 Display Panel

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KN52281,10043C3 -19-23OCT12-2/4



LVAL12072 —UN—17NOV10

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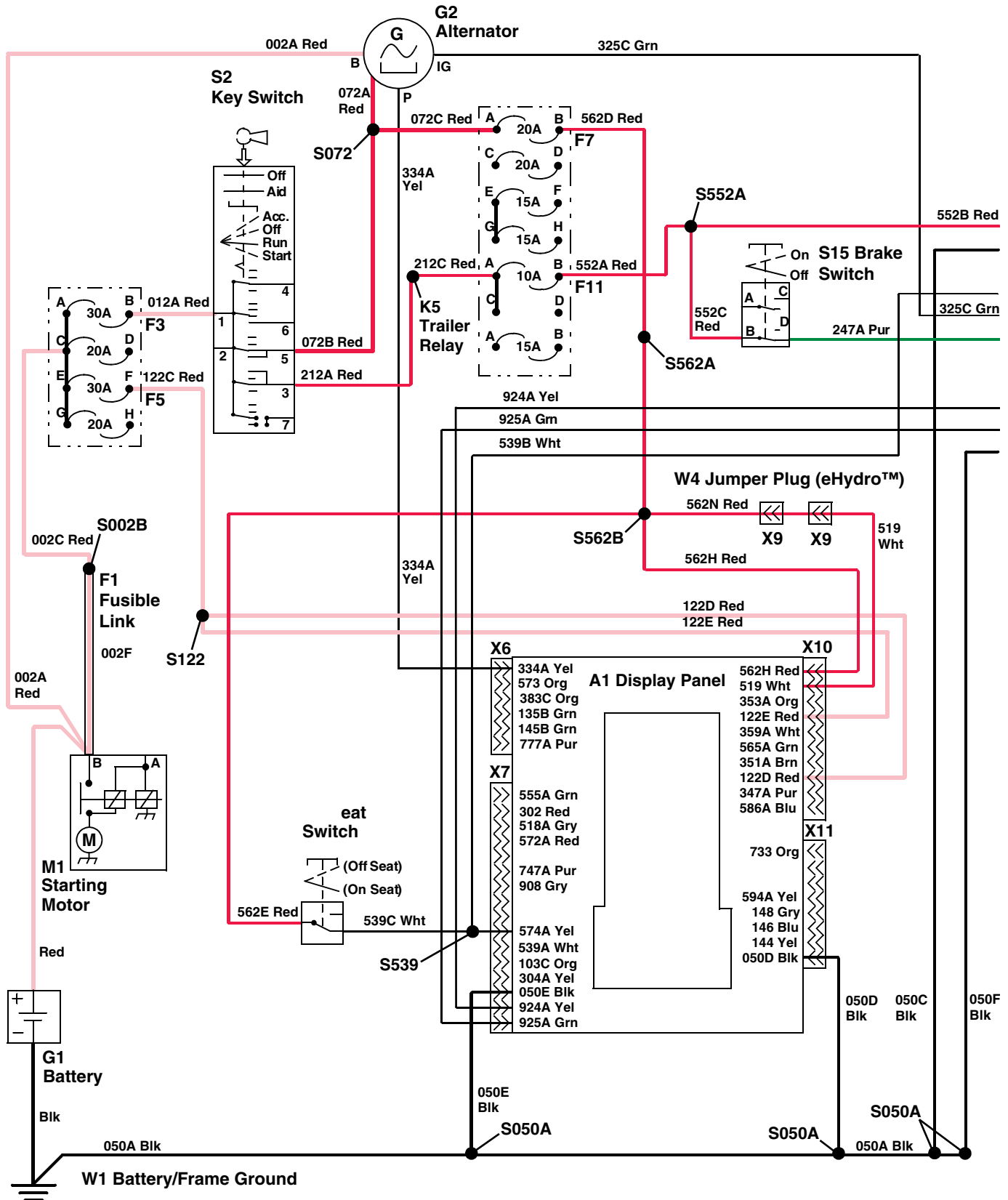
KN52281,10043C3 -19-23OCT12-3/4

A2—Electronic Drive Controller	X5—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X36— W9 eHydro™ Wiring Harness to T1 Forward Pedal Sensor	Y4—Reverse Proportional Solenoid
S12— Load Match Switch			Y5—Forward Proportional Solenoid
S15— Motion Match Switch	X33— W9 eHydro™ Wiring Harness to A2 Electronic Drive Controller	X37— W9 eHydro™ Wiring Harness to T2 Throttle Position Sensor	
T1— Forward Pedal Sensor	X34— W9 eHydro™ Wiring Harness to W10 Proportional Valve Wiring Harness	X38— W9 eHydro™ Wiring Harness to T3 MFWD Speed Sensor	
T2— Throttle Position Sensor		X39— W9 eHydro™ Wiring Harness to T4 Reverse Pedal Sensor	
T3— MFWD Speed Sensor			
T4— Reverse Pedal Sensor			
X4—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X35— W9 eHydro™ Wiring Harness to W11 Cruise Control Wiring Harness (standard)		

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KN52281,10043C3 -19-23OCT12-4/4

eHydro™—Load Match and Motion Match Circuit Electrical Schematic—MY13



LVAL38906 —UN—15JAN13

Continued on next page

KN52281,10043DA -19-10JAN13-1/4

A1—Display Panel
F1—Fusible Link
F3—Fuse 30A
F5—Fuse 30A
F7—Fuse 20A
F11—Fuse 10A
G1—Battery
G2—Alternator
M1—Starting Motor

S2—Key Switch
S8—Seat Switch
S15—Brake Switch
W1—Battery/Frame Ground
W4—Jumper Plug
X6—W1 Main Wiring Harness to
A1 Display Panel

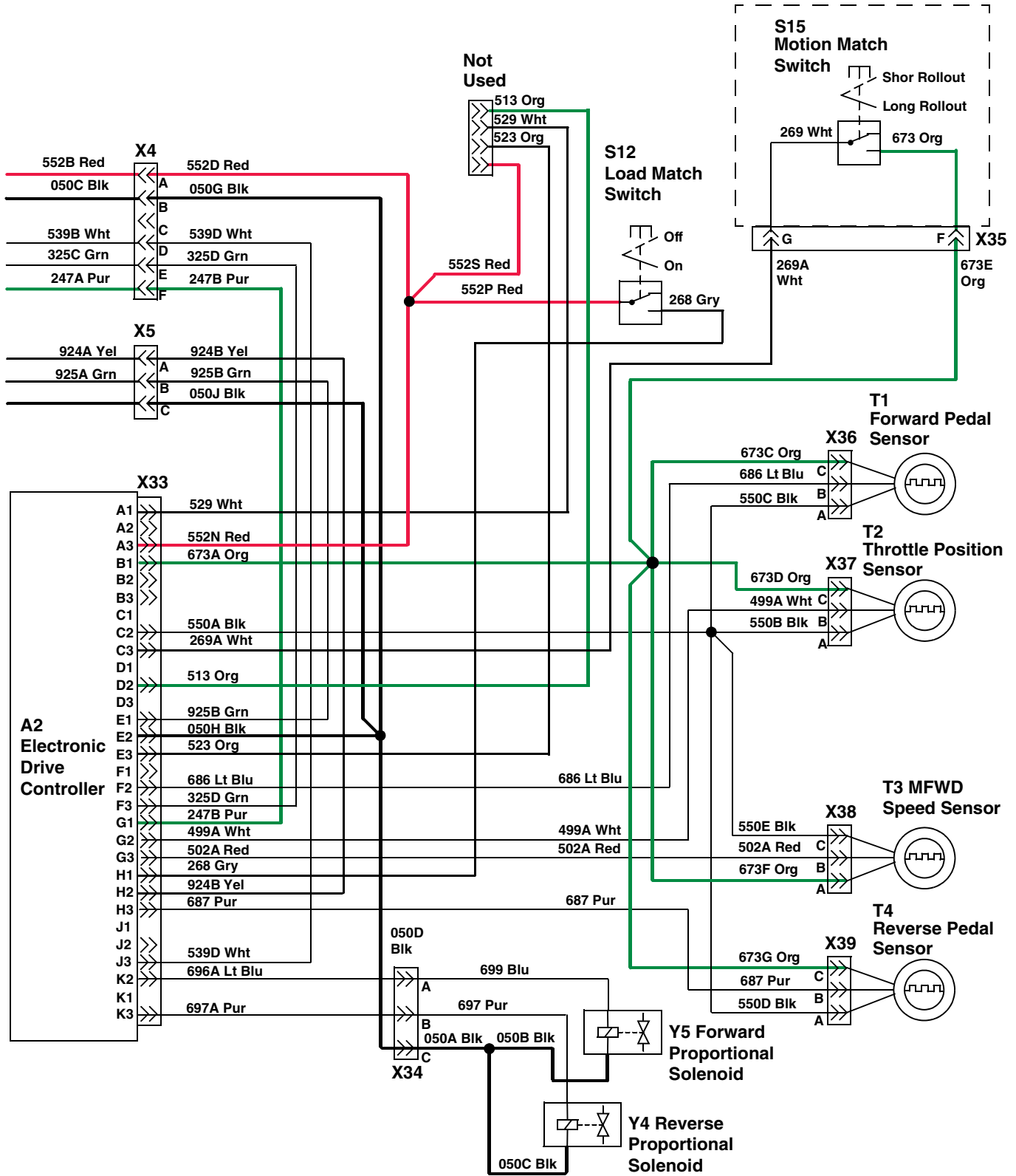
X7—W1 Main Wiring Harness to
A1 Display Panel
X9—W1 Main Wiring Harness to
S11 Transmission Neutral
Switch (PRT), W4 Jumper
Plug (eHydro™)

X10—W1 Main Wiring Harness
to A1 Display Panel
X11—W1 Main Wiring Harness
to A1 Display Panel

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KN52281,10043DA -19-10JAN13-2/4



Continued on next page

KN52281,10043DA -19-10JAN13-3/4

LVAL38907 —UN—15JAN13

A2—Electronic Drive Controller	X5—W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X36— W9 eHydro™ Wiring Harness to T1 Forward Pedal Sensor	Y4—Reverse Proportional Solenoid
S12— Load Match Switch		X37— W9 eHydro™ Wiring Harness to T2 Throttle Position Sensor	Y5—Forward Proportional Solenoid
S15— Motion Match Switch	X33— W9 eHydro™ Wiring Harness to A2 Electronic Drive Controller	X38— W9 eHydro™ Wiring Harness to T3 MFWD Speed Sensor	
T1— Forward Pedal Sensor	X34— W9 eHydro™ Wiring Harness to W10 Proportional Valve Wiring Harness	X39— W9 eHydro™ Wiring Harness to T4 Reverse Pedal Sensor	
T2— Throttle Position Sensor			
T3— MFWD Speed Sensor			
T4— Reverse Pedal Sensor			
X4— W1 Main Wiring Harness to W9 eHydro™ Wiring Harness	X35— W9 eHydro™ Wiring Harness to W11 Cruise Control Wiring Harness (standard)		

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KN52281,10043DA -19-10JAN13-4/4

eHydro™—Load Match and Motion Match Control Circuit Diagnosis

Test Procedure A—Load Match:

Verify that the load match switch has been configured and edited into the display panel memory. (See [Configure the Display](#) in Section 40, Group 45.), and (see [Editing Load Match Settings—eHydro™](#) in Section 40, Group 45.)

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on eHydro™

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models. (See [Entering Diagnostic and Calibration Modes](#) in Section 40, Group 45.) and follow Diagnostic Mode 2 (eHydro™/Auto HST).

Test Conditions:

- Key switch in run position, engine not running.
- Operator on seat.
- Park brake locked.
- Load match switch moved from off to on.
- Motion match switch off.

KN52281,10043C4 -19-23OCT12-1/12

Load Match Circuit

KN52281,10043C4 -19-23OCT12-2/12

Step 1

Do any fault codes appear in the LCD display?

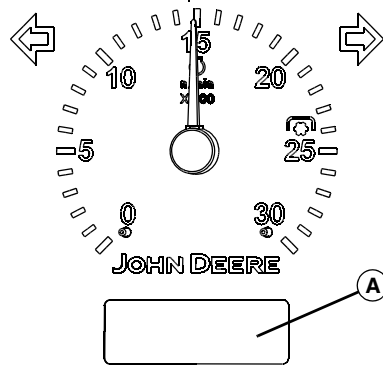
YES: Correct the possible faults. (See [Display Panel Fault Code Chart](#) in Section 50, Group 30.)

NO: Go to next step.

Continued on next page

KN52281,10043C4 -19-23OCT12-3/12

Step 2



LVAL12073 —UN—17NOV10

A—LCD Display

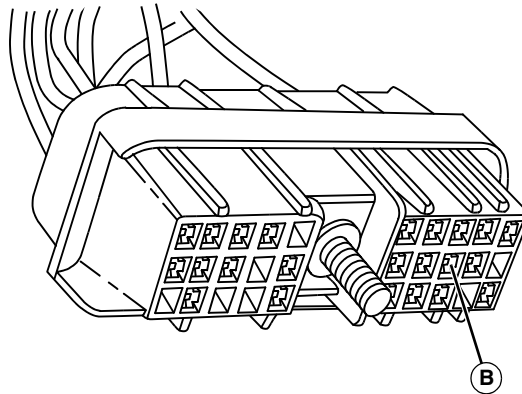
Press and release the display mode switch until the words “LoAdOF” appear in the LCD display (A). Place the load match switch in the on position. Does the display change to “LoAdOn”?

YES: Circuit is functional.

NO: Go to next step.

KN52281,10043C4 -19-23OCT12-4/12

Step 3



LVAL12074 —UN—17NOV10

B—X33 Connector Terminal H1, 268 Gry Wire

Disconnect the X33 connector to the drive controller. Is battery voltage present at terminal H1, 268 Gry wire (B)?

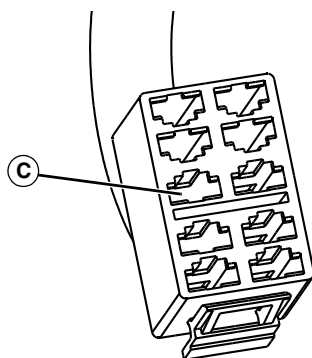
YES: If the display panel does not display “LoAdOn”, check the 924 Yel and 925 Grn wires and connections. if ok, replace the drive controller.

NO: Test the load match switch. (See [Load Match Switch Test—eHydro™](#) in Section 40, Group 40.) Check the 268 Gry wire and connections. Go to next step.

Continued on next page

KN52281,10043C4 -19-23OCT12-5/12

Step 4



LVAL12075 —UN—17NOV10

C—552 Red Wire

Disconnect the load match switch. Is battery voltage present at the load match switch, 552 Red wire (C)?

YES: Test complete.

NO: Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

KN52281,10043C4 -19-23OCT12-6/12

Test Procedure B—Motion Match:

Verify that the motion match switch has been configured and edited into the display panel memory. (See [Configure the Display](#) in Section 40, Group 45.), and [Editing Motion Match Settings—eHydro™/Auto HST](#) in Section 40, Group 45.)

Use the diagnostic mode within the drive controller and display panel to diagnose drive failures on eHydro™ models. (See [Entering Diagnostic and](#)

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[Calibration Modes](#) in Section 40, Group 45.) and follow Diagnostic Mode 2 (eHydro™/Auto HST).

Test Conditions:

- Key switch in run position, engine not running.
- Operator on seat.
- Park brake locked.
- Load match switch off.
- Motion match switch moved from off to on.

KN52281,10043C4 -19-23OCT12-7/12

Motion Match Circuit

KN52281,10043C4 -19-23OCT12-8/12

Step 1

Do any fault codes appear in the LCD display?

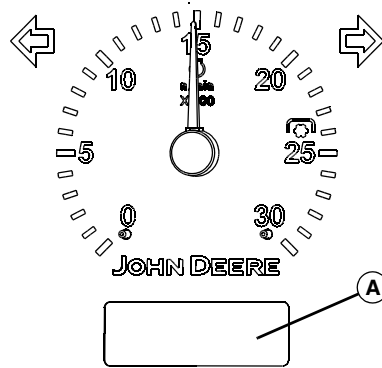
YES: Correct the possible faults. (See [Display Panel Fault Code Chart](#) in Section 50, Group 30.)

NO: Go to next step.

Continued on next page

KN52281,10043C4 -19-23OCT12-9/12

Step 2



LVAL12076 —UN—17NOV10

A—LCD Display

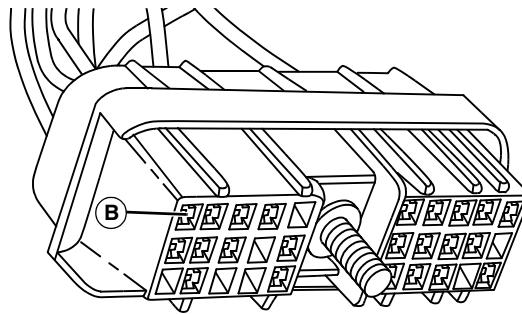
Press and release the display mode switch until the words "Motn OF" appear in the LCD display (A). Place the load match switch in the on position. Does the display change to "Motn On"?

YES: Circuit is functional.

NO: Go to next step.

KN52281,10043C4 -19-23OCT12-10/12

Step 3



LVAL12077 —UN—12NOV10

B—552 Red Wire

Disconnect the X33 connector to the drive controller. Is battery voltage present at terminals A3, 552 Red wire (B)?

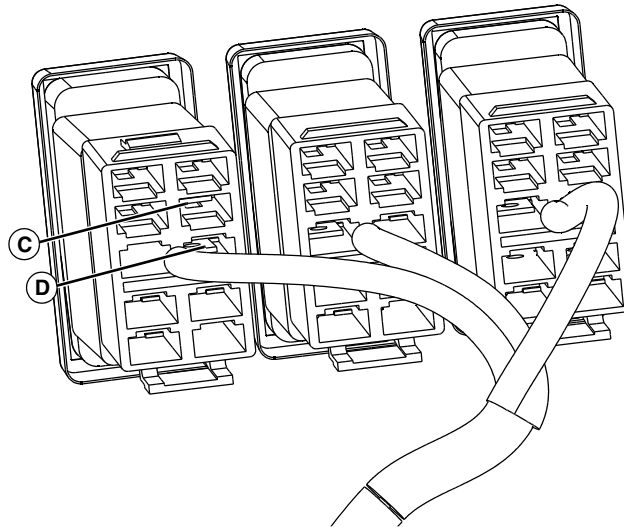
YES: Go to next step.

NO: Test the switched power circuit. (See [Power Circuit Diagnosis](#) in Section 50, Group 35.)

Continued on next page

KN52281,10043C4 -19-23OCT12-11/12

Step 4



LVAL12078 —UN—12NOV10

C—269 Wht Wire
D—673 Org Wire

With motion match switch in the on position. Is battery voltage present at the 269 Wht (C) and 673 Org (D) wires?

YES: Check the 269 Wht wire and connections. If ok, replace drive controller.

NO: 269 Wht wire. Test the motion match switch. (See [Motion Match Switch Test—eHydro™/Auto HST](#) in Section 40, Group 40.) Check the 673, 673E and 673A Org wires and connections.

NO: 673 Org wire. Check the 673, 673E and 673A Org wires and connections. If ok, replace drive controller.

KN52281,10043C4 -19-23OCT12-12/12

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Repair Specifications

PRT Hydraulic Clutch:

Item	Measurement	Specification
Clutch Linkage		
Adjustment	Distance (center-to-center)	232 mm (9.134 in.)
PRT Clutch Plates		
End Plate	Thickness (minimum)	4.85 mm (0.191 in.)
Separator Plate(s)	Thickness (minimum)	2.85 mm (0.112 in.)
Friction Plate(s)	Thickness (minimum)	2.7 mm (0.106 in.)
Clutch Spring	Length (minimum)	45.5 mm (1.79 in.)

SW03989,0000C2A -19-05NOV10-1/1

Torque Specifications

Item	Measurement	Specification
General Torque Specifications		
SCV Port Tube Hydraulic Line Nut	Torque	40—57 N·m (30—43 lb-ft)
PTO Pressure Tube To PTO Valve Hydraulic Line Nut	Torque	40—57 N·m (30—43 lb-ft)
PTO Pressure Tube To Hydraulic Pump Nut	Torque	40—57 N·m (30—43 lb-ft)
Gear Case To Gear Case Cap Screw	Torque	126—154 N·m (95—115 lb-ft)
Center Plate To Housing Cap Screw	Torque	85 N·m (63 lb-ft)
Front Cover To Clutch Housing (Tunnel) Cap Screw	Torque	23—29 N·m (17—22 lb-ft)
Reverse Case To Front Cover Cap Screw	Torque	19—23 N·m (14—17 lb-ft)
Traction Clutch Mounting Cap Screw	Torque	43 N·m (32 lb-ft)
Neutral Switch	Torque	27 N·m (20 lb-ft)
Mounting Valve Block Cap Screw	Torque	24.4 N·m (18 lb-ft)
Detent Assembly Cap Screw	Torque	19 N·m (14 lb-ft)
Cover Plate Cap Screw	Torque	26 N·m (21 lb-ft)
Valve Block To Valve Block Cap Screw	Torque	24.4 N·m (18 lb-ft)
Hydraulic Line to Valve Block Nut	Torque	40—57 N·m (30—43 lb-ft)

SW03989,0000C2B -19-05NOV10-1/1

Essential or Recommended Tools

NOTE: Order tools from the *SERVICEGARD™ Catalog*.

ESSENTIAL TOOLS listed are required to perform the job correctly and are obtainable only from the *SERVICEGARD™ Catalog*.

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RECOMMENDED TOOLS, as noted, are suggested to perform the job correctly. Some tools may be available from local suppliers or may be fabricated.

SW03989,0000C2C -19-05NOV10-1/2

Spring Washer Compressor	JDT 24B	Hose	JTO 3017
To compress spring on clutch packs.		Hydraulic pressure tests	
Splitting Stands and Brackets.....	JTO 7335-1,2,3	Gauge.....	JTO 3344
For splitting machine		Hydraulic pressure tests	
Adapter	JTO 3349		
Hydraulic pressure tests			

SW03989,0000C2C -19-05NOV10-2/2

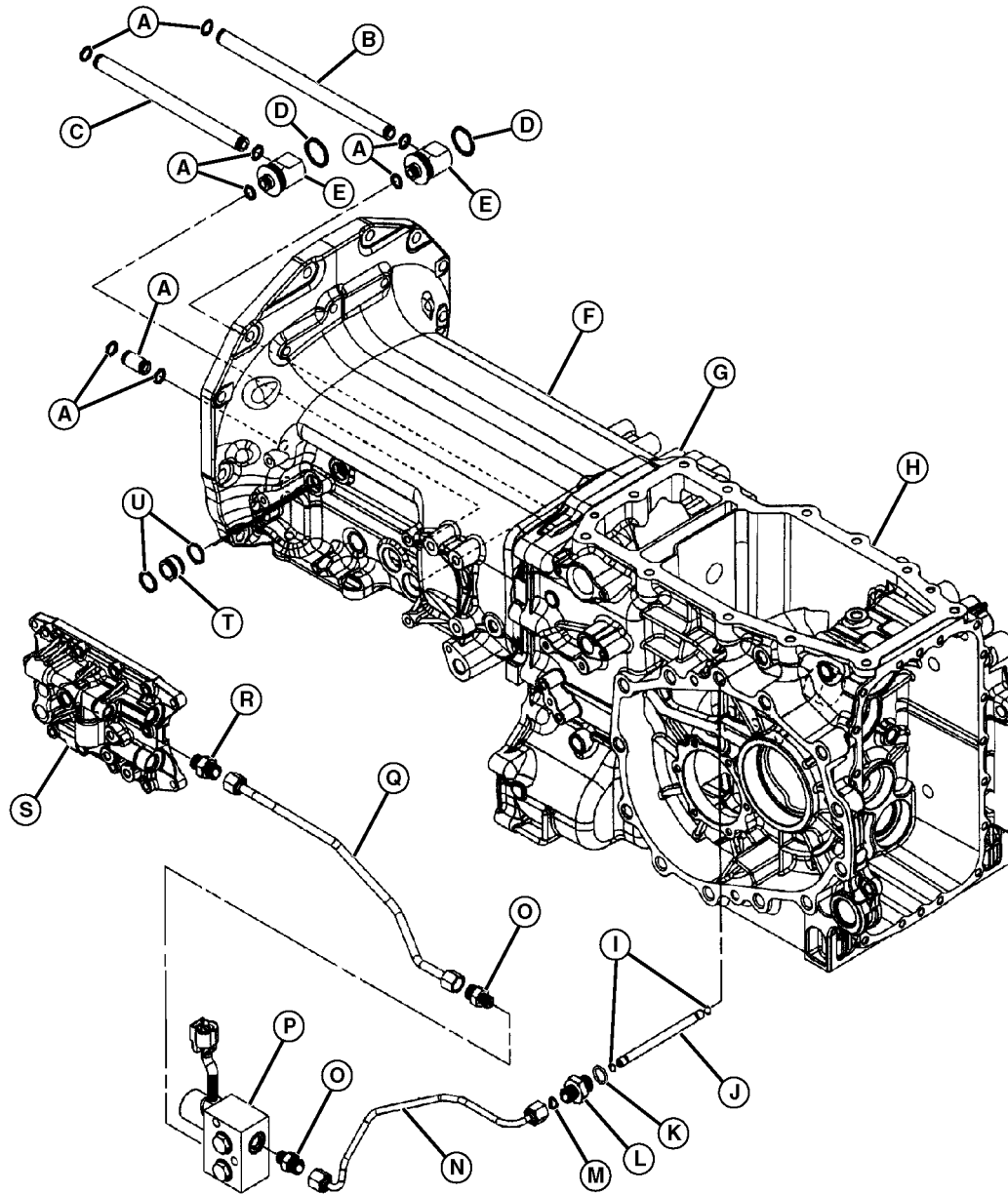
Other Material

Number	Name	Use
PM37509 (U.S.)	John Deere Clean and Cure Primer	Clean mating surfaces; helps speed curing.
PM37465 Canada PM38616 587 (U.S.®)	RTV Silicone Form-in-Place Gasket	Sealing non-gasketed surfaces
TY6333 (U.S.)	Moly High Temperature EP Grease	To lubricate synchronizers.
PM37418 Canada PM37477 242 (U.S.®)	Thread Lock and Sealer (Medium Strength)	On dowel pins and certain cap screws.

Loctite is a trademark of Henkel Corporation

MM61211,00000C6 -19-12NOV10-1/1

Tunnel and Transmission Case



Tunnel and Transmission Case Components

A—O-Ring
B—Hydraulic Tube
C—Hydraulic Tube
D—O-Ring
E—Elbow Fitting
F—Tunnel Case

G—Center Case
H—Transmission and Final Drive Case
I—O-Ring
J—Hydraulic Tube
K—O-Ring

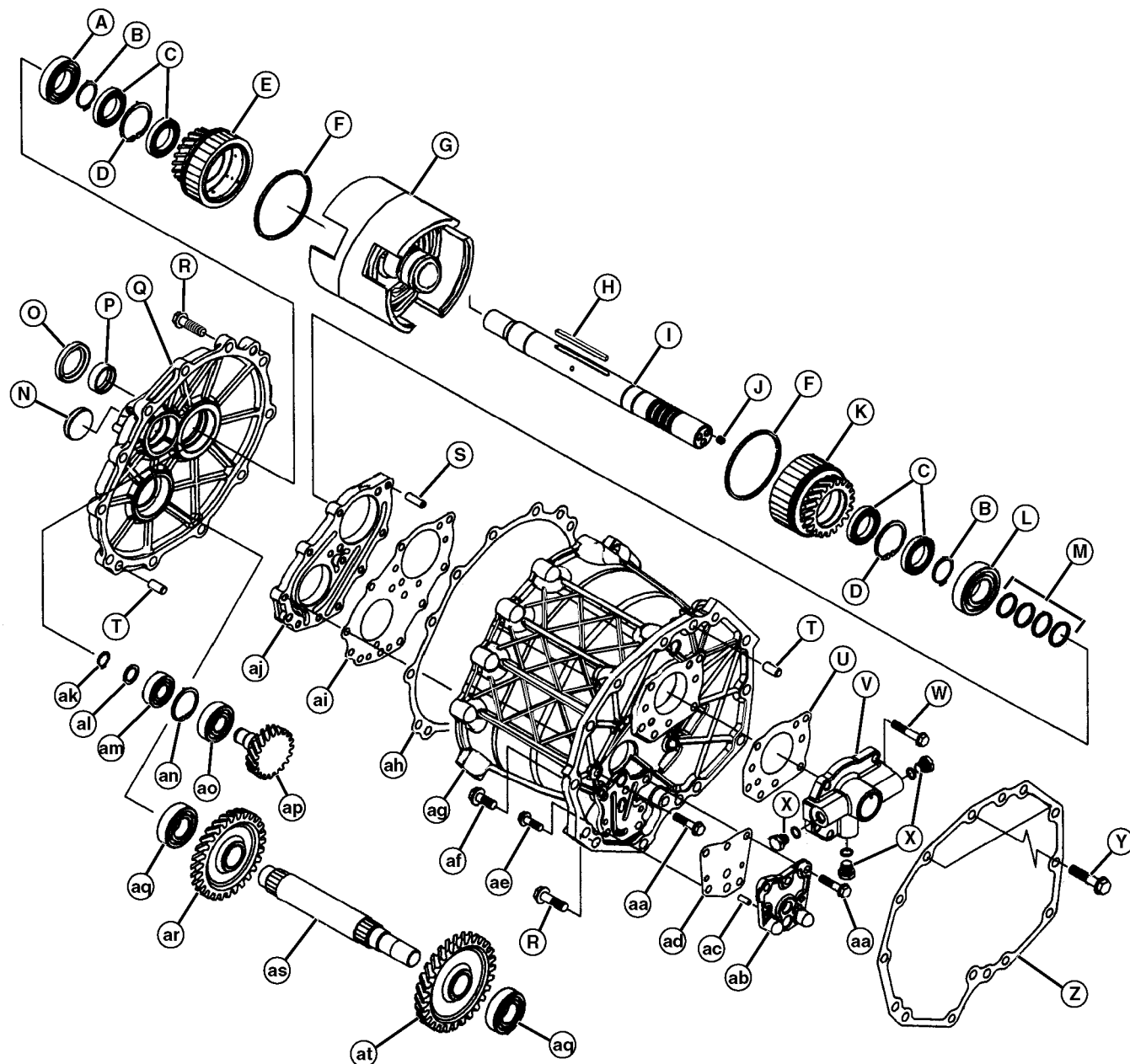
L—Adaptor Fitting
M—O-Ring
N—Hydraulic Line
O—Adaptor Fitting
P—PTO Valve Manifold

Q—Hydraulic Line
R—Adaptor Fitting
S—PRT Valve
T—Hydraulic Tube
U—O-Ring

LVAL12079 —UN—29OCT10

SW03989,0000C2E -19-05NOV10-1/1

PRT Clutch



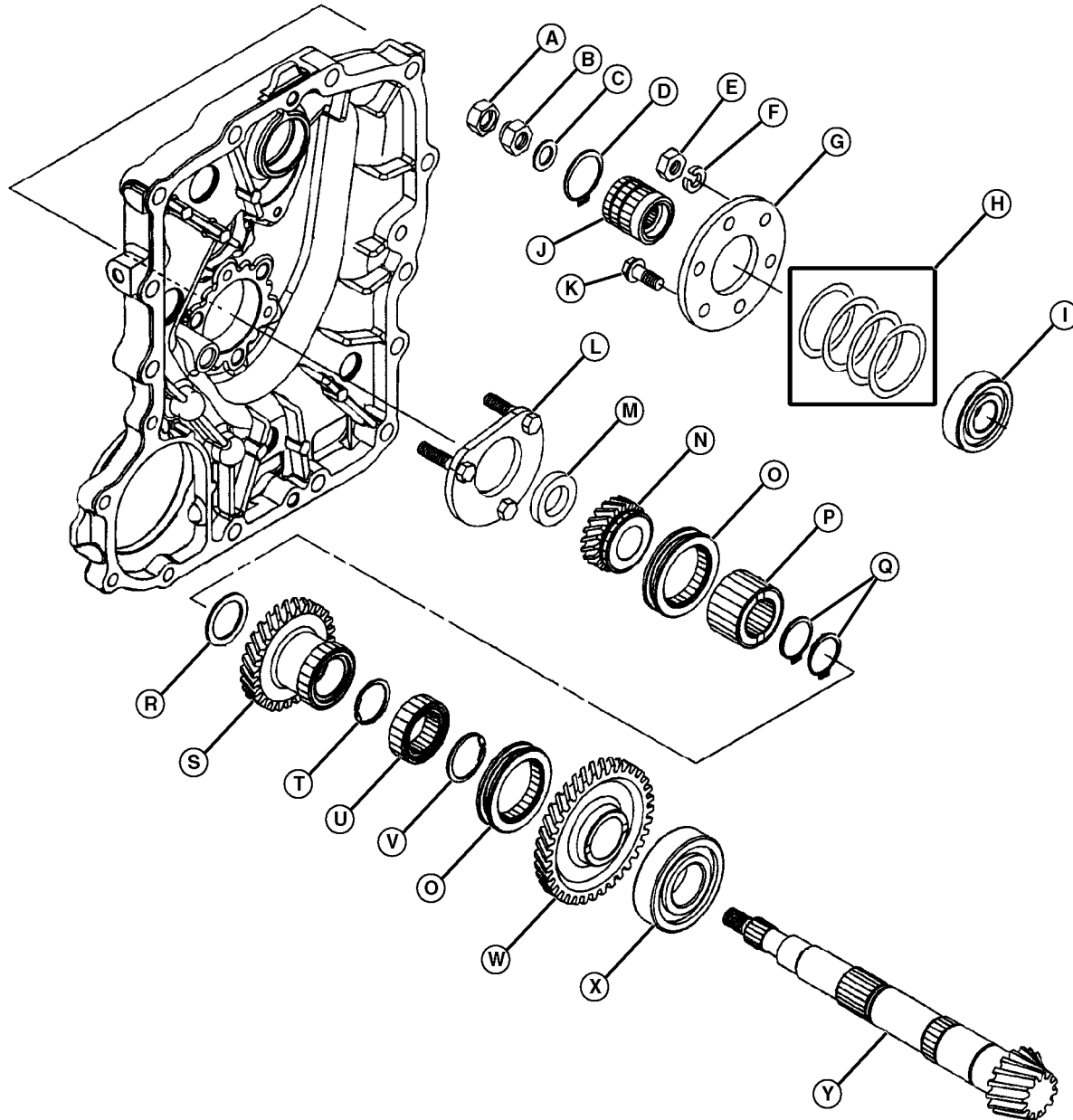
PRT Clutch Components

A—Bearing	N—Plug	Z—Gasket	AK—Retaining Ring
B—Retaining Ring	O—Shaft Seal	AA—Cap Screw M8x35	AL—Washer
C—Bearing	P—Sleeve	AB—Cover Plate	AM—Bearing
D—Retaining Ring	Q—Cover	AC—Alignment Dowel	AN—Retaining Ring
E—Clutch Gear, 25T	R—Cap Screw M10x35	AD—Gasket	AO—Bearing
F—Ring	S—Alignment Dowel	AE—Cap Screw M8x35	AP—Reverse Idler Gear, 22T
G—Clutch Housing	T—Alignment Dowel	AF—Cap Screw M8x25	AQ—Bearing
H—Key	U—Gasket	AG—Traction Clutch Case	AR—Shaft Gear, 42T
I—Clutch Shaft	V—Valve Case	AH—Gasket	AS—Shaft
J—Port Plug	W—Cap Screw M8x45	AI—Gasket	AT—Shaft Gear, 45T
K—Clutch Gear, 26T	X—Plug and O-Ring	AJ—Bearing Holder	
L—Bearing	Y—Cap Screw M10x45		
M—Shaft Seals			

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SW03989,0000C2F -19-05NOV10-1/1

Drive/Pinion Shaft



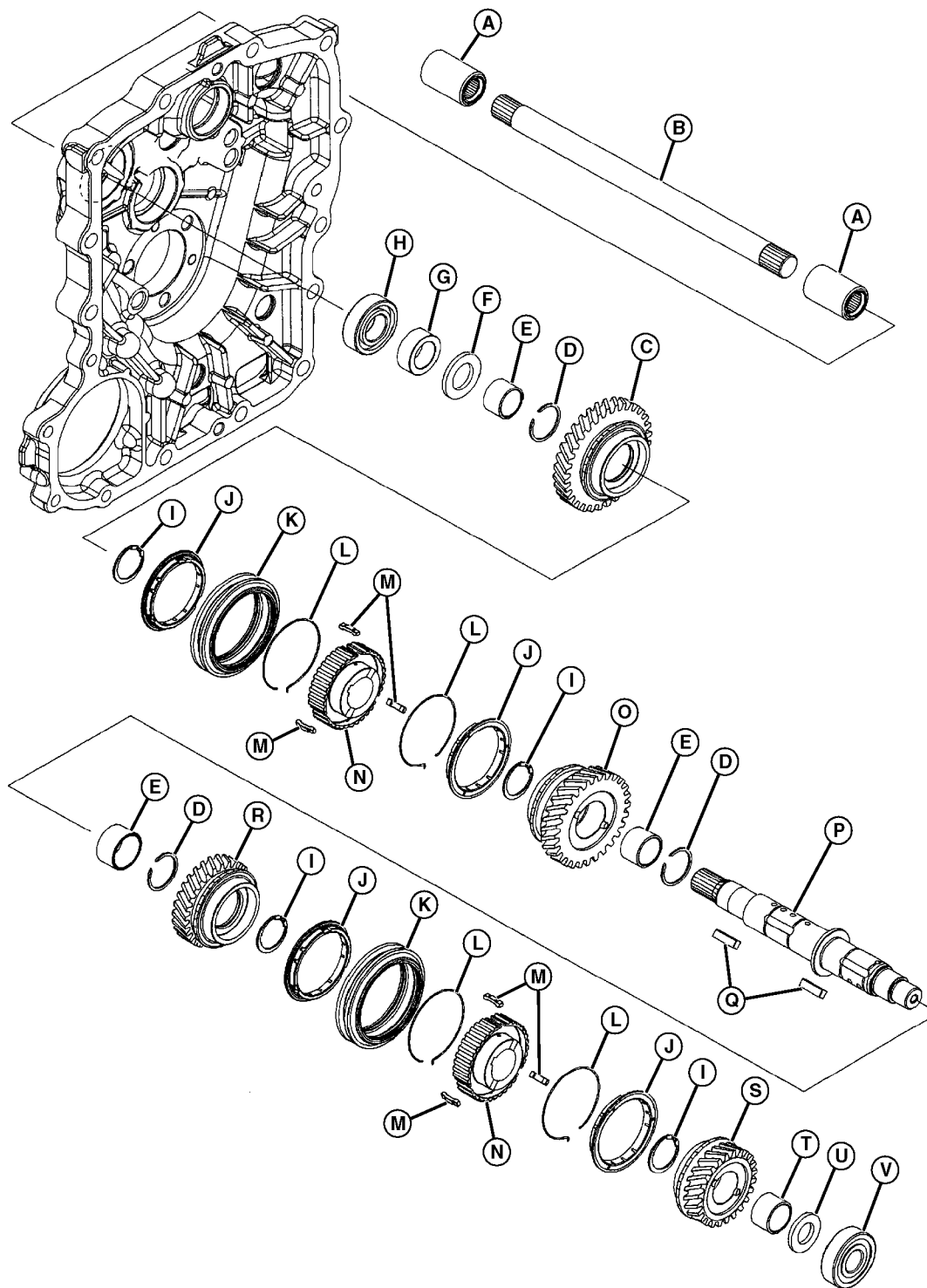
Drive/Pinion Shaft Components

- | | | | |
|--------------------------|--------------------------|------------------------|----------------------|
| A—Wedge Nut | H—Shims (used as needed) | O—Shift Collar | V—Retaining Ring |
| B—Collared Jam Nut | I—Bearing | P—Long Splined Collar | W—Gear, 51T |
| C—Spacer | J—Coupler Gear | Q—Retaining Ring | X—Bearing |
| D—Retaining Ring | K—Cap Screw | R—Spacer | Y—Drive/Pinion Shaft |
| E—Nut | L—Inner Bearing Retainer | S—Gear, 35T | |
| F—Lock Washer | M—Spacer | T—Retaining Ring | |
| G—Outer Bearing Retainer | N—Gear, 20T | U—Short Splined Collar | |

SW03989,0000C30 -19-05NOV10-1/1

LVAL12081 —UN—29OCT10

4 Speed Gear Shaft



4 Speed Gear Shaft Components

A—Coupler
B—Shaft
C—Gear, 33T
D—Retaining Ring
E—Needle Bearing
F—Thin Spacer

G—Wide Spacer
H—Bearing
I—Retaining Ring
J—Synchromesh Gear
K—Shift Collar

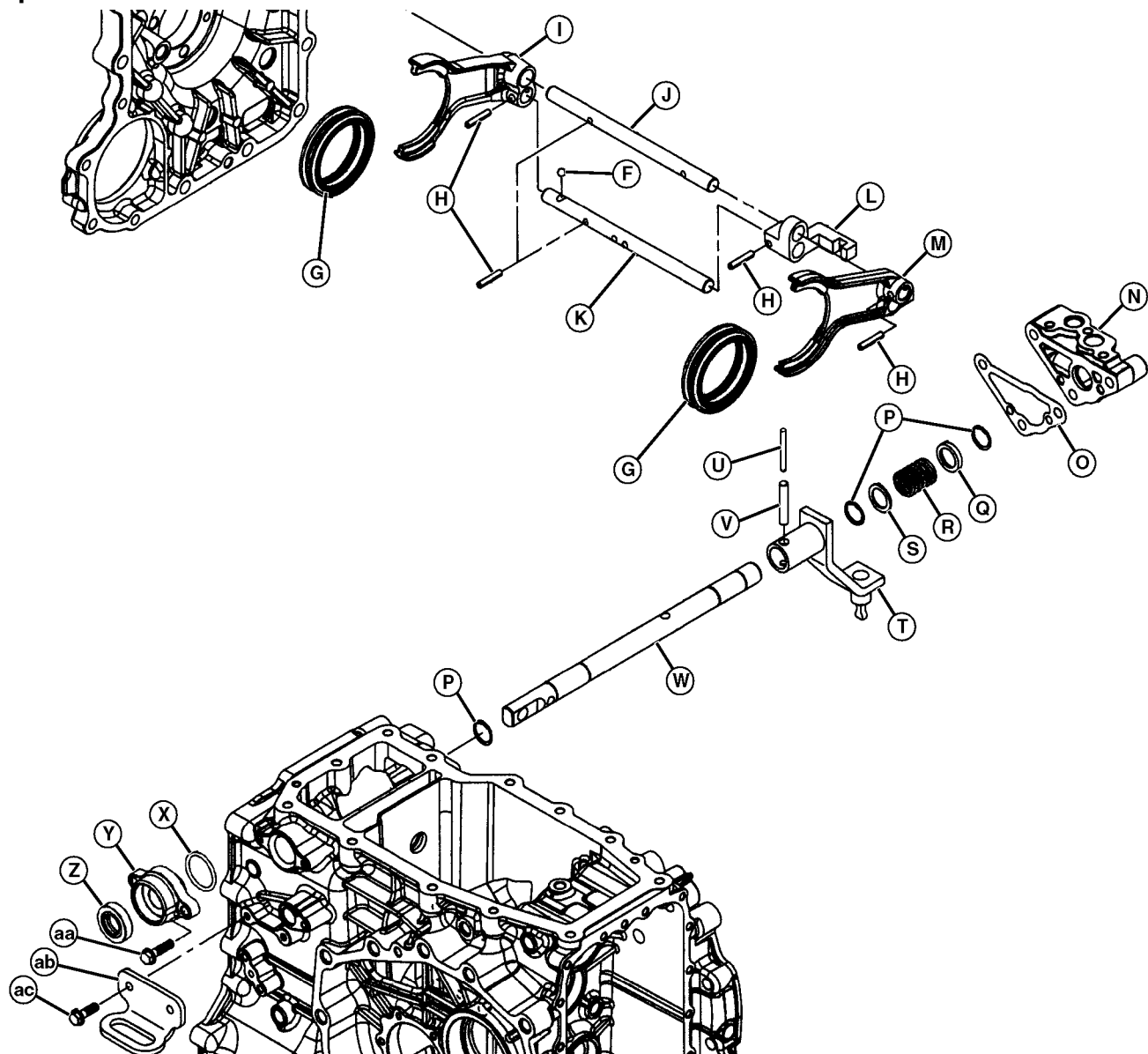
L—Wire Ring Clip
M—Ring Keys
N—Synchromesh Ring
O—Gear, 29T
P—Shaft
Q—Keys

R—Gear, 23T
S—Gear, 26T
T—Needle Bearing
U—Thin Spacer
V—Bearing

LVAL12082 —UN—29OCT10

SW03989,0000C31 -19-05NOV10-1/1

4 Speed Gear Shift



4 Speed Gear Shift Components

A—Cap Screw
B—Plate, Keeper
C—Cap Screw (2 used)
D—O-Ring (2 used)
E—Detent Spring (2 used)
F—Detent Ball (2 used)
G—Shift Collar
H—Pin Fastener (5 used)

I—Shift Fork (3-4)
J—Shift Fork Shaft (1-2)
K—Shift Fork Shaft (3-4)
L—Shift Arm Retainer
M—Shift Fork (1-2)
N—Manifold/Shift Shaft Holder

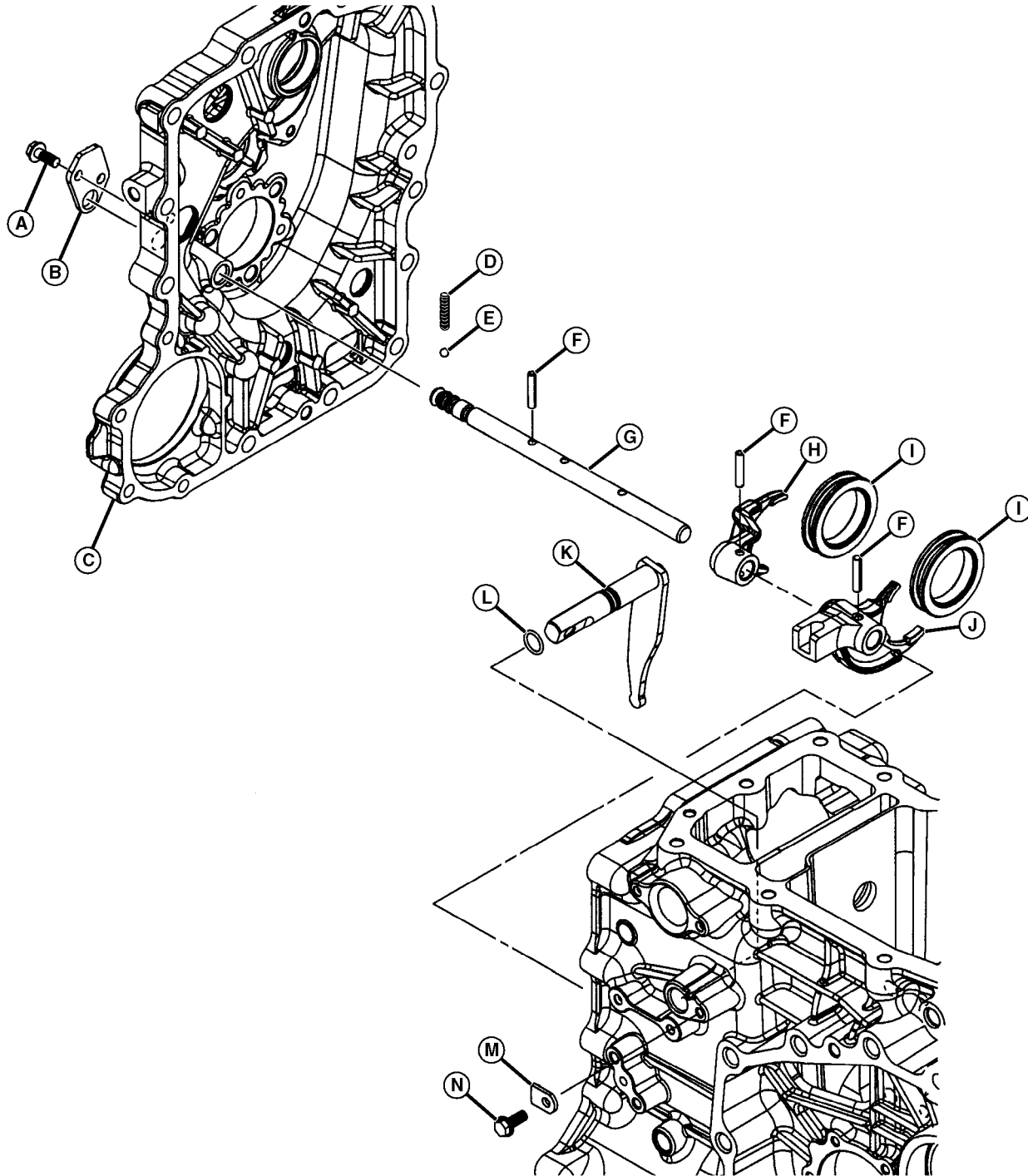
O—Gasket
P—O-Ring (3 used)
Q—Spring Carrier
R—Compression Spring
S—Spring Retainer
T—Main Shift Arm
U—Pin Fastener
V—Pin Fastener
W—Main Shift Shaft

X—O-Ring
Y—Shift Shaft Holder
Z—Shaft Seal
AA—Cap Screw
AB—Shift Arm Holder
AC—Cap Screw

SW03989,0000C32 -19-05NOV10-1/1

LVAL12083 —UN—29OCT10

Range Shift



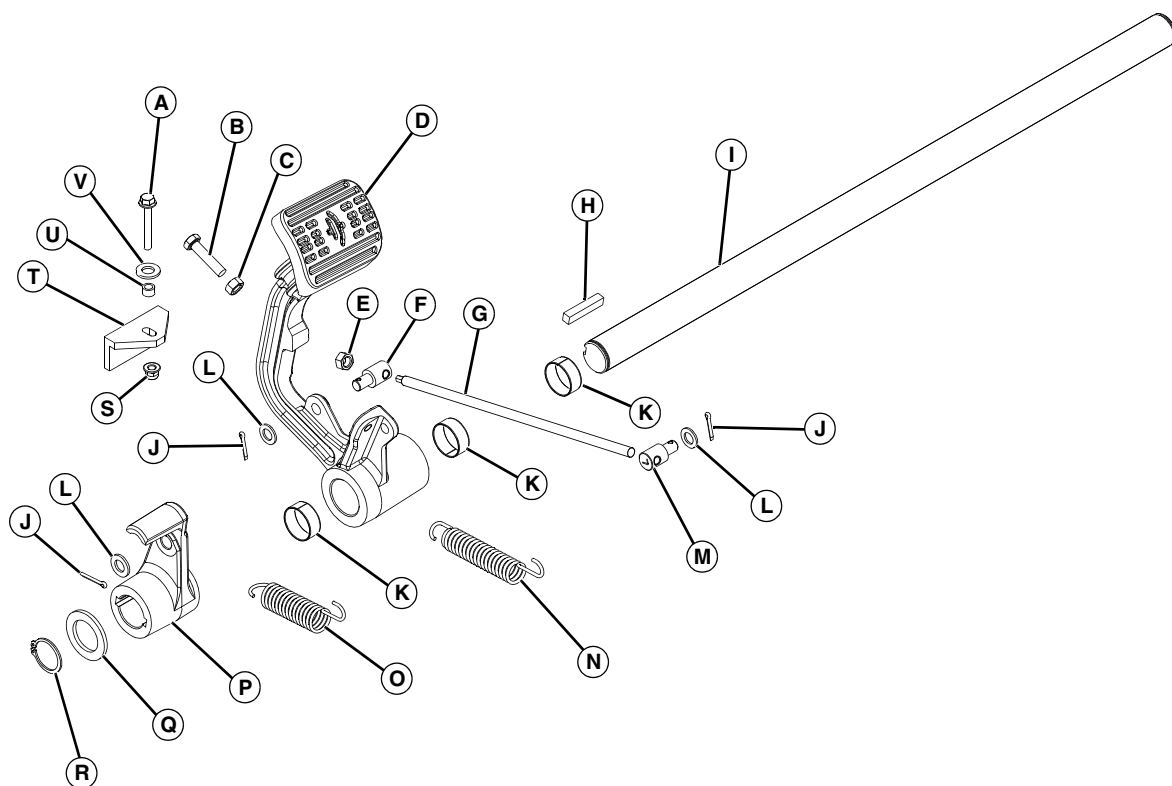
Range Shift Components

- | | | | |
|--------------------|---------------------|-------------------------|---------------|
| A—Cap Screw | F—Roll Pin (3 used) | I—Shift Collar (2 used) | L—O-Ring |
| B—Plate, Fork Lock | G—Range Shift Shaft | J—Range Shift Fork | M—Plate, Keep |
| C—Center Plate | H—Range Shift Fork | K—Fork Shift Shaft | N—Cap Screw |
| D—Spring | | | |
| E—Ball, 1/4 in. | | | |

SW03989,0000C33 -19-05NOV10-1/1

LVAL12084 —UN—29OCT10

PRT Pedal and Shift Linkage



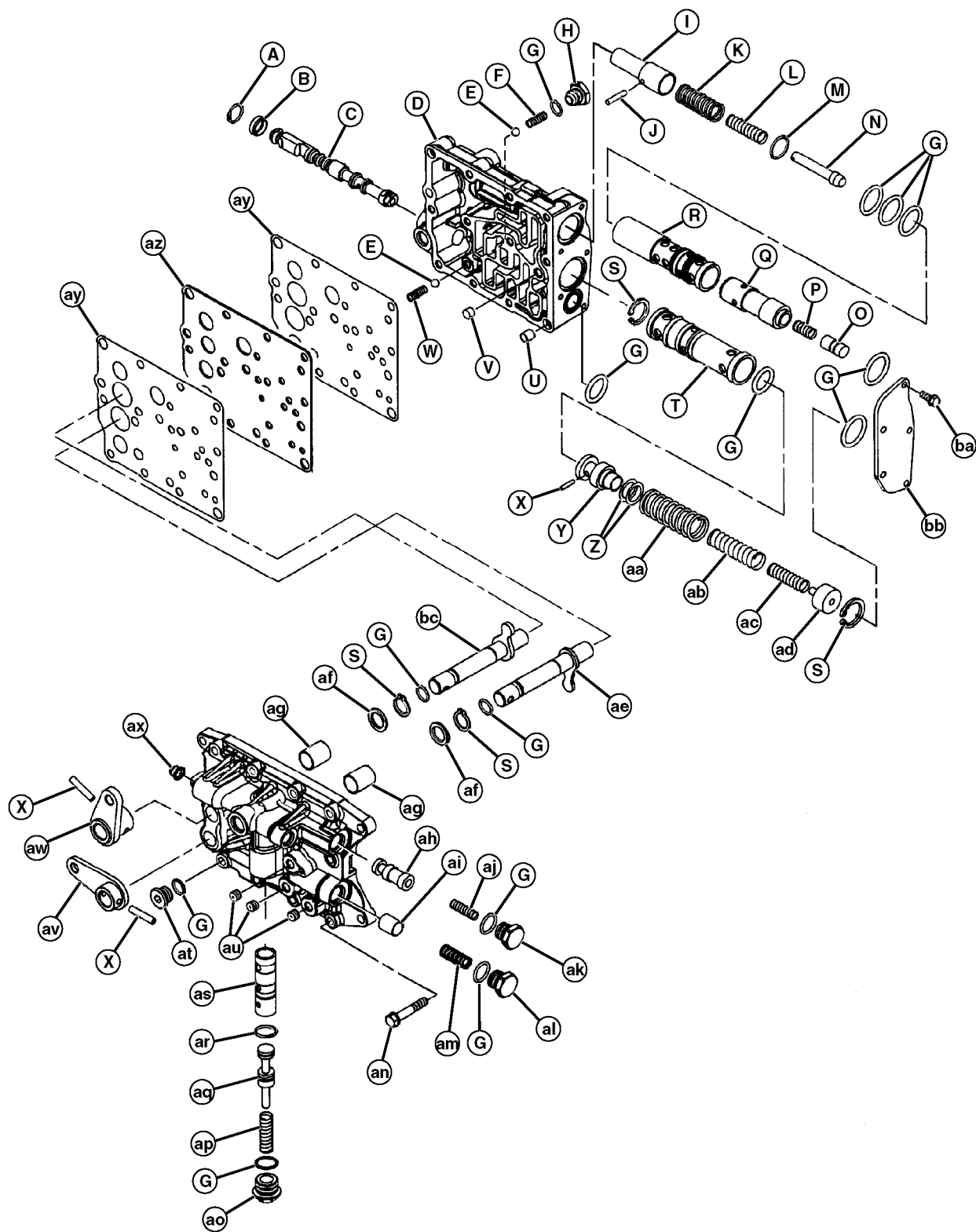
PRT Pedal and Shift Linkage Components

- | | | | |
|------------------------------|-----------------------------|------------------------|-----------------------|
| A—Cap Screw | G—Pushrod | N—Clutch return Spring | S—Nut |
| B—Cap Screw | H—Key | O—Brake Return Spring | T—Pedal Stop (Rubber) |
| C—Nut | I—Pedal Shaft | P—Bellcrank | U—Spacer |
| D—Clutch Pedal | J—Cotter Pin | Q—Washer | V—Washer |
| E—Jam Nut | K—Bushing | R—Snap Ring | |
| F—Swivel (Right-hand Thread) | L—Washer | | |
| | M—Swivel (Left-hand Thread) | | |

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LVAL12085—UN—29OCT10

PRT Valve



PRT Valve Components

LVAL12086 —UN—29OCT10

Continued on next page

SW03989,0000C35 -19-05NOV10-1/2

Component Location

A—Snap Ring	N—Guide Pin	AB—Center Drive Spring	AP—Pressure Spring
B—Plug	O—Clutch Valve Piston	AC—Inner Drive Spring	AQ—Pressure Valve
C—Spool (Forward/Reverse)	P—Clutch Valve Return Spring	AD—Drive Valve	AR—Gasket
D—Valve Case	Q—Clutch Valve	AE—Shift Arm	AS—Pressure Sleeve
E—Steel Ball	R—Sleeve	AF—Washer	AT—Plug
F—Detent Spring	S—Snap Ring	AG—Bearing	AU—Plug
G—O-Ring	T—Drive Sleeve	AH—Cut-off Valve	AV—Shift Lever
H—Detent Plug	U—Pin	AI—Relief Valve	AW—Clutch Lever
I—Clutch Valve Spool	V—Orifice	AJ—Cut-off Spring	AX—Strainer
J—Pin	W—Detent Spring	AK—Cut-off Plug	AY—Case Gasket
K—Outer Clutch Valve Spring	X—Spring Pin	AL—Plug	AZ—Separation Plate
L—Clutch Valve Inner Spring	Y—Relief Valve	AM—Second Spring	BA—Screw
M—Washer	Z—Shim	AN—Cap Screw	BB—Plate
	AA—Outer Drive Spring	AO—Pressure Plug	

SW03989,0000C35 -19-05NOV10-2/2

PRT Control Valve Operation

Lever In Neutral, Clutch Pedal Up

Function:

The PRT control valve provides hydraulic oil to the forward and reverse PRT clutch (H), and controls all functions of the hydraulic reverser.

Major Components:

- Clutch Pedal Valve (B)
- Lubrication Relief Valve (O)
- Lubrication Cut-Off Valve (M)
- Modulation Valve (P)
- Forward / Reverse Valve (C)

Theory of Operation:

With the clutch pedal in the UP position, charge oil flows to three places; passage of clutch pedal valve, passage

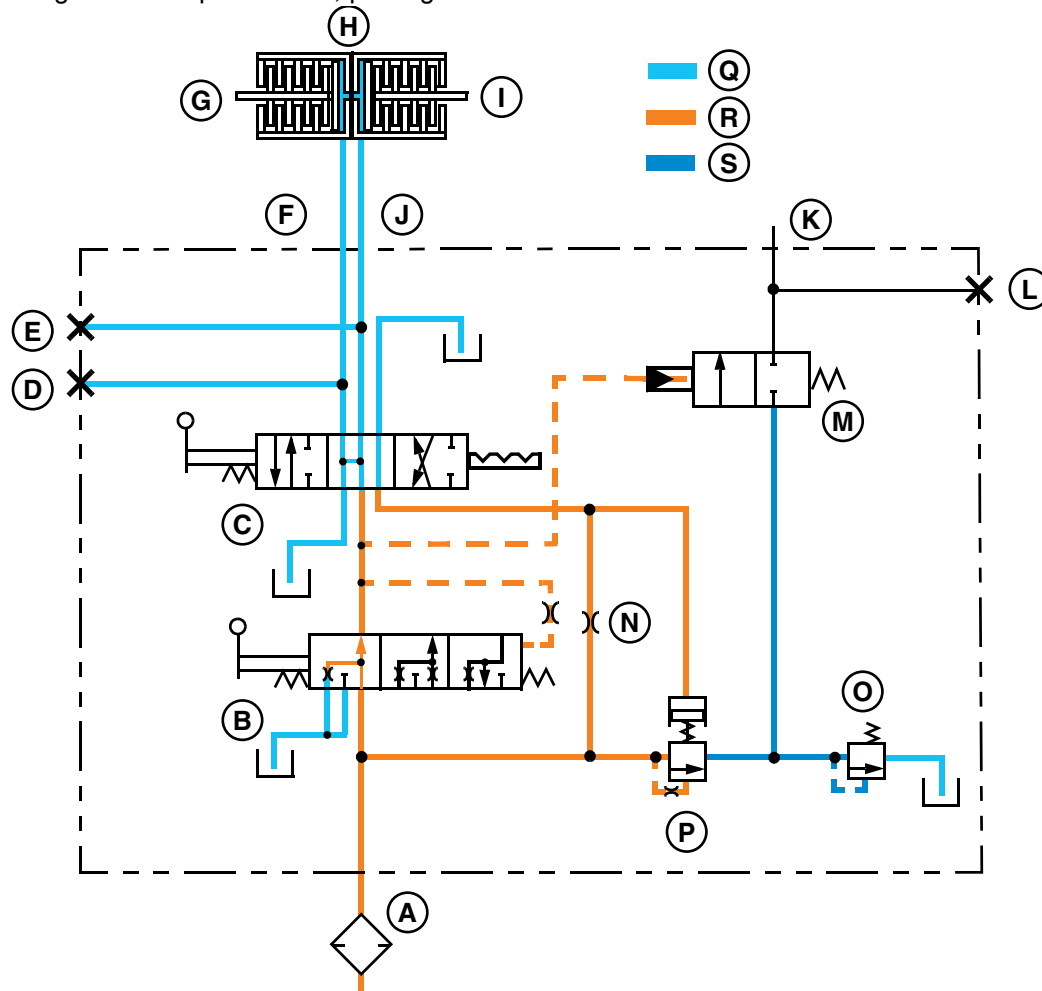
of modulation valve, and through 0.7 mm (N) orifice to the modulation valve.

Oil flows through the clutch pedal valve to the forward / reverse valve. With the forward / reverse valve in the NEUTRAL position, oil returns to the sump through the sump passage.

Oil entering the modulation valve does not have enough pressure to overcome the spring pressure, and the modulation valve remains closed.

Oil flowing through the 0.7 mm orifice continues, flows through the forward / reverse valve, and returns to the sump.

Oil between the clutch pedal valve and the forward / reverse valve is insufficient to overcome the spring pressure of the lubrication cut-off valve. With the lubrication cut-off valve unable to open, oil is trapped between the relief valves and the lubrication cut-off valve.



PRT Control Valve Operation

- | | | | |
|--|---------------------------------------|-----------------------------|-----------------------------|
| A—Pressure In | E—Reverse Test Port | K—Lubrication Oil Port | P—Modulation Valve |
| B—Clutch Pedal Valve (up position) | F—Forward Port | L—Lubrication Oil Test Port | Q—Sump Oil |
| C—Forward / Reverse Valve (neutral position) | G—Forward Clutch | M—Lubrication Cut-Off Valve | R—Pressure Oil |
| D—Forward Test Port | H—Forward and Reverse Clutch Assembly | N—0.7 mm Orifice | S—Lubrication Oil (trapped) |
| | I—Reverse Clutch | O—Lubrication Relief Valve | |
| | J—Reverse Port | | |

Continued on next page

SW03989,0000C36 -19-15NOV10-1/7

Lever In Forward, Clutch Pedal Down

Function:

The PRT control valve provides hydraulic oil to the forward and reverse PRT clutch (H), and controls all functions of the hydraulic reverser.

Major Components:

- Clutch Pedal Valve (B)
- Lubrication Relief Valve (O)
- Lubrication Cut-Off Valve (M)
- Modulation Valve (P)
- Forward / Reverse Valve (C)

Theory of Operation:

The charge oil passage and forward / reverse valve passage are blocked by the clutch pedal valve.

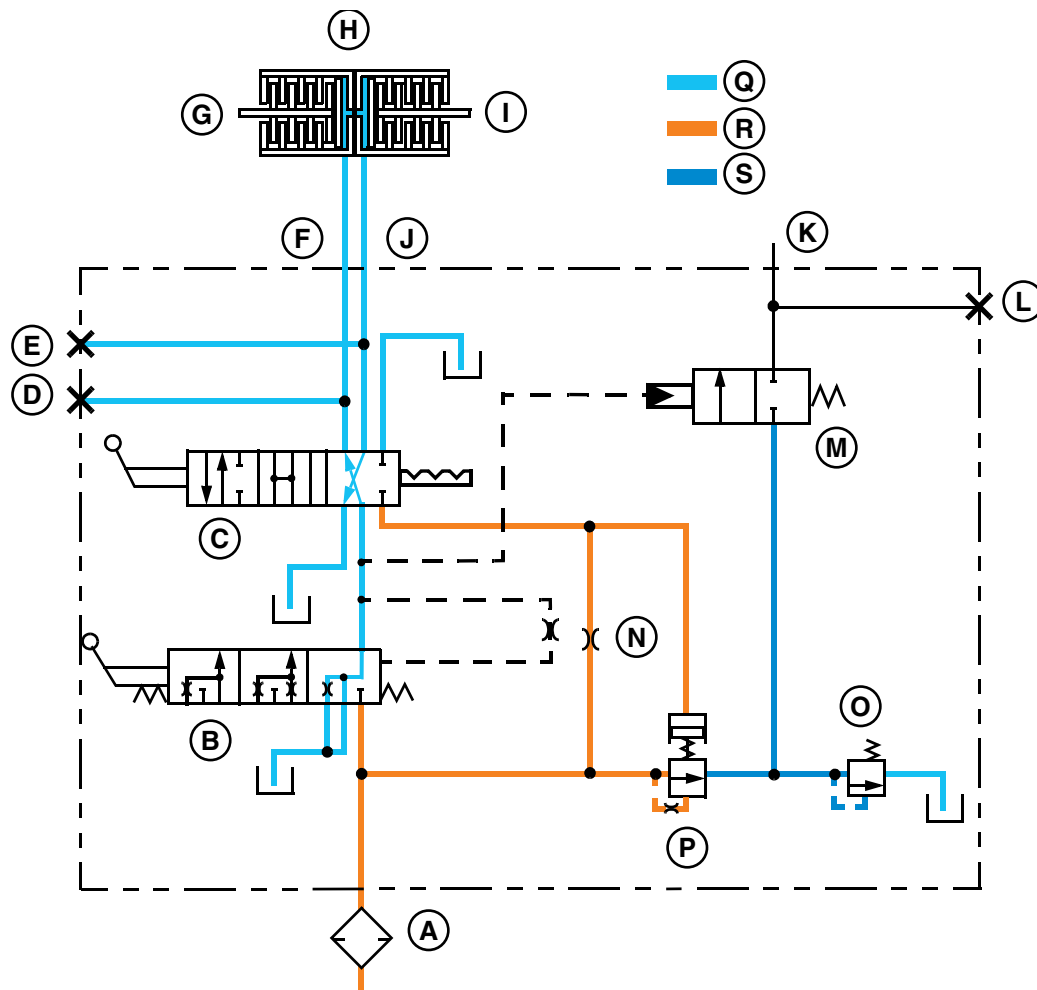
Under these conditions, the modulation valve relieves the oil to the open lubrication relief valve which returns the oil to the sump.

System pressure will be increased as the oil from the charge oil passage flows through the forward / reverse valve (forward passage), and starts clutch engagement.

Stroke adjustment of the clutch pedal is able to control machine speed.

Continued on next page

SW03989,0000C36 -19-15NOV10-2/7



Lever In Forward, Clutch Pedal Down

A—Pressure In	E—Reverse Test Port	K—Lubrication Oil Port	P—Modulation Valve
B—Clutch Pedal Valve (up position)	F—Forward Port	L—Lubrication Oil Test Port	Q—Sump Oil
C—Forward / Reverse Valve (neutral position)	G—Forward Clutch	M—Lubrication Cut-Off Valve	R—Pressure Oil
D—Forward Test Port	H—Forward and Reverse Clutch Assembly	N—0.7 mm Orifice	S—Lubrication Oil (trapped)
	I—Reverse Clutch	O—Lubrication Relief Valve	
	J—Reverse Port		

Lever In Forward, Clutch Pedal Up

Function:

The PRT control valve provides hydraulic oil to the forward and reverse PRT clutch (H), and controls all functions of the hydraulic reverser.

Major Components:

- Clutch Pedal Valve (B)
- Lubrication Relief Valve (O)
- Lubrication Cut-Off Valve (M)
- Modulation Valve (P)
- Forward / Reverse Valve (C)

Theory of Operation:

When the forward / reverse lever is moved from the NEUTRAL to the FORWARD position, system hydraulic

pressure flows to three places; passage of the clutch pedal valve, passage of the modulation relief valve, and through the 0.7 mm orifice (N) to the modulation valve.

Oil pressure flowing through the orifice is blocked by the spool of the forward / reverse valve, causing pressure to push against the piston of the modulation valve. The piston pushes against the three nested springs contained in the modulation valve, closing the valve. The spring force increases the pressure at which the relief valve opens. The increased pressure flows to the forward clutch pack.

The three springs also act as an accumulator, allowing oil pressure to increase at different rates, providing modulated engagement of the clutch pack.

As the pressure modulates, the modulation relief valve opens and closes, providing lubrication oil to the clutch packs. This oil flows through the lubrication cut-off valve.

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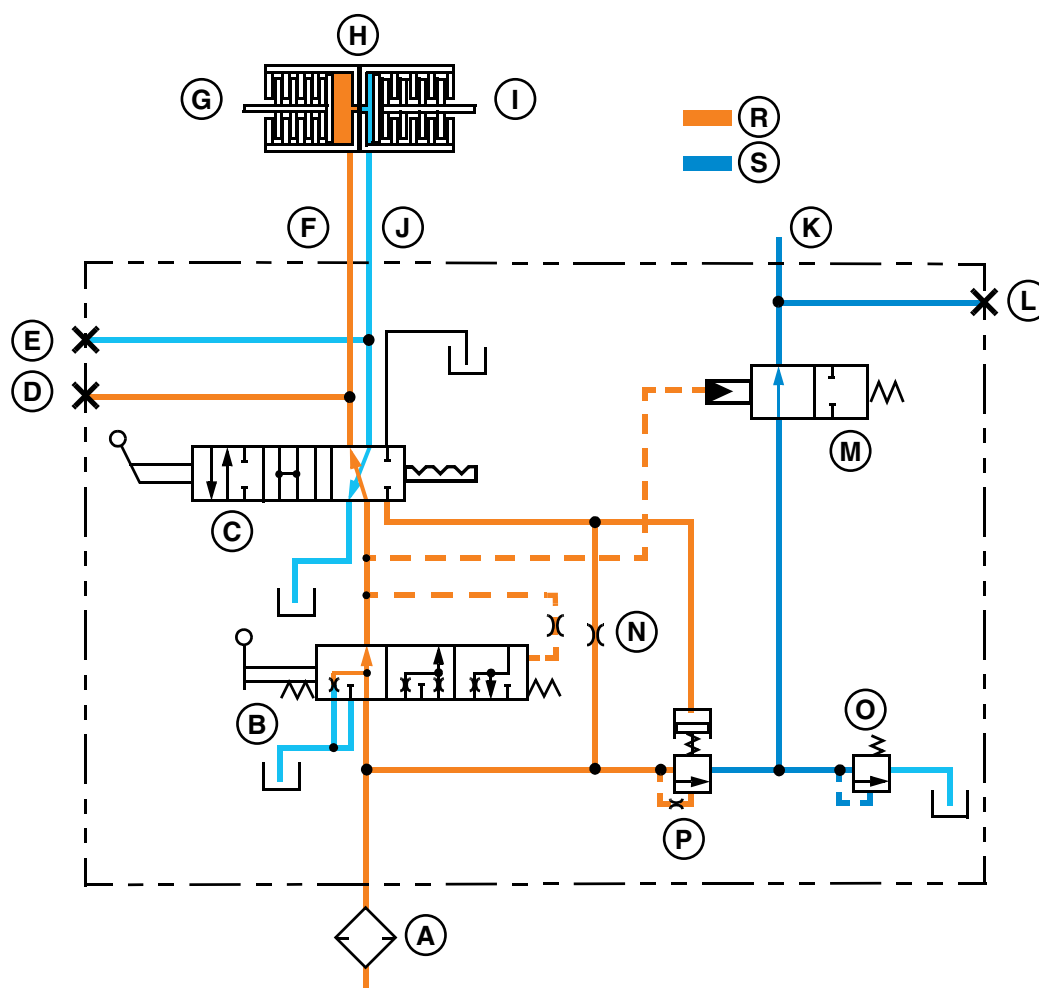
SW03989,0000C36 -19-15NOV10-3/7

System pressure also flows from the clutch pedal valve to the forward / reverse valve. With the forward / reverse valve in the FORWARD position, the forward / reverse

spool is shifted and oil flows through the valve to the hydraulic reverser forward clutch.

Continued on next page

SW03989,0000C36 -19-15NOV10-4/7



Lever In Reverse, Clutch Pedal Up

A—Pressure In
 B—Clutch Pedal Valve (up position)
 C—Forward / Reverse Valve (neutral position)
 D—Forward Test Port

E—Reverse Test Port
 F—Forward Port
 G—Forward Clutch
 H—Forward and Reverse Clutch Assembly
 I—Reverse Clutch

J—Reverse Port
 K—Lubrication Oil Port
 L—Lubrication Oil Test Port
 M—Lubrication Cut-Off Valve
 N—0.7 mm Orifice

O—Lubrication Relief Valve
 P—Modulation Valve
 R—Pressure Oil
 S—Lubrication Oil (trapped)

Lever In Reverse, Clutch Pedal Up

Function:

The PRT control valve provides hydraulic oil to the forward and reverse PRT clutch, and controls all functions of the hydraulic reverser.

Major Components:

- Clutch Pedal Valve (B)
- Lubrication Relief Valve (O)
- Lubrication Cut-Off Valve (M)
- Modulation Valve (P)
- Forward / Reverse Valve (C)

Theory of Operation:

When the forward / reverse lever is moved from the NEUTRAL to the REVERSE position, system hydraulic

pressure flows to three places; passage of the clutch pedal valve, passage of the modulation relief valve, and through the 0.7 mm (N) orifice to the modulation valve.

Oil pressure flowing through the orifice is blocked by the spool of the forward / reverse valve, causing pressure to push against the piston of the modulation valve. The piston pushes against the three nested springs contained in the modulation valve, closing the valve. The spring force increases the pressure at which the relief valve opens. The increased pressure flows to the forward clutch pack.

The three springs also act as an accumulator, allowing oil pressure to increase at different rates, providing modulated engagement of the clutch pack.

As the pressure modulates, the modulation relief valve opens and closes, providing lubrication oil to the clutch packs. This oil flows through the lubrication cut-off valve.

LVAL12089 —UN—16NOV10

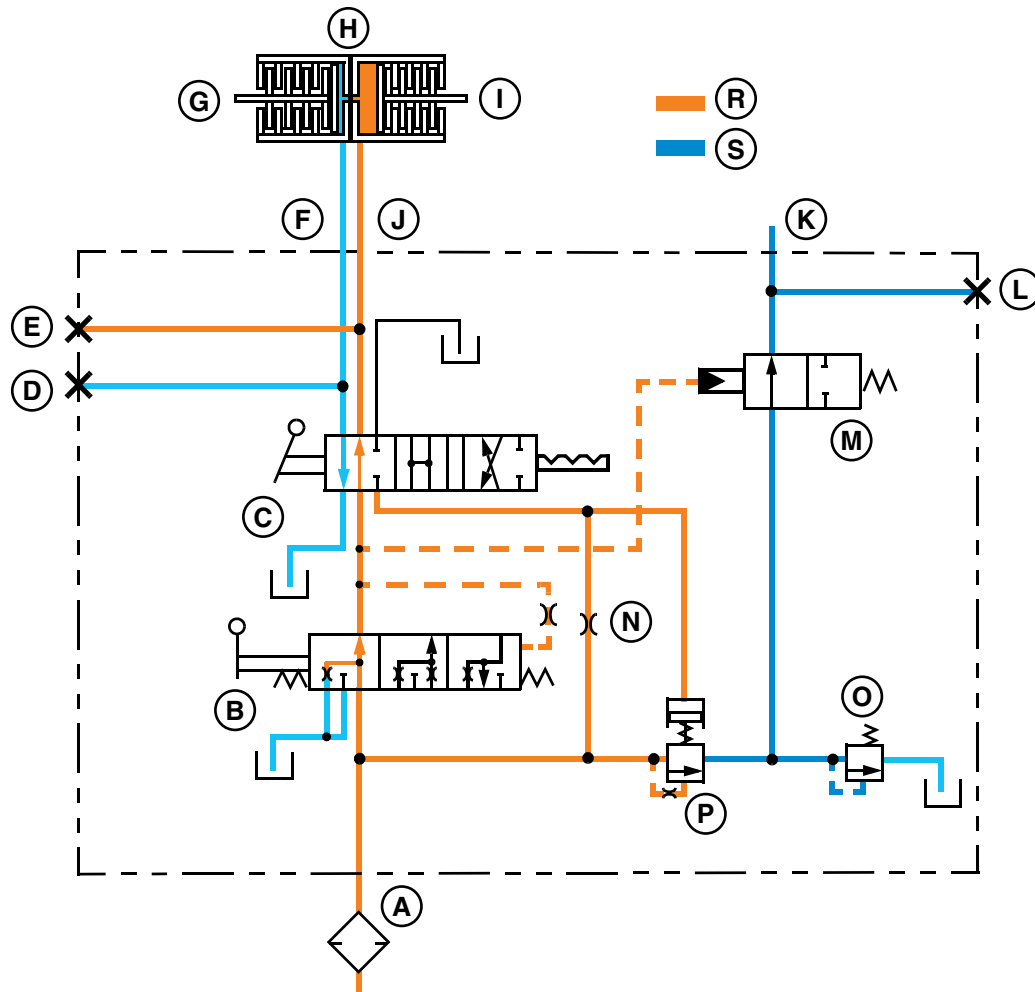
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SW03989,0000C36 -19-15NOV10-5/7

System pressure also flows from the clutch pedal valve to the forward / reverse valve. With the forward / reverse valve in the REVERSE position, the forward / reverse

spool is shifted and oil flows through the valve to the hydraulic reverser reverse clutch.

SW03989,0000C36 -19-15NOV10-6/7



Lever In Reverse, Clutch Pedal Up

- | | | | |
|--|---------------------------------------|-----------------------------|-----------------------------|
| A—Pressure In | E—Reverse Test Port | J—Reverse Port | O—Lubrication Relief Valve |
| B—Clutch Pedal Valve (up position) | F—Forward Port | K—Lubrication Oil Port | P—Modulation Valve |
| C—Forward / Reverse Valve (neutral position) | G—Forward Clutch | L—Lubrication Oil Test Port | R—Pressure Oil |
| D—Forward Test Port | H—Forward and Reverse Clutch Assembly | M—Lubrication Cut-Off Valve | S—Lubrication Oil (trapped) |
| | I—Reverse Clutch | N—0.7 mm Orifice | |

SW03989,0000C36 -19-15NOV10-7/7

LVAL12090—UN—16NOV10

PRT Clutch Operation—Forward

Function:

To transfer power from the engine flywheel, through the clutch cylinder and transfer shaft to the 4 speed transmission shaft to rotate the 4 speed transmission shaft in the opposite direction of the engine flywheel.

Theory of Operation:

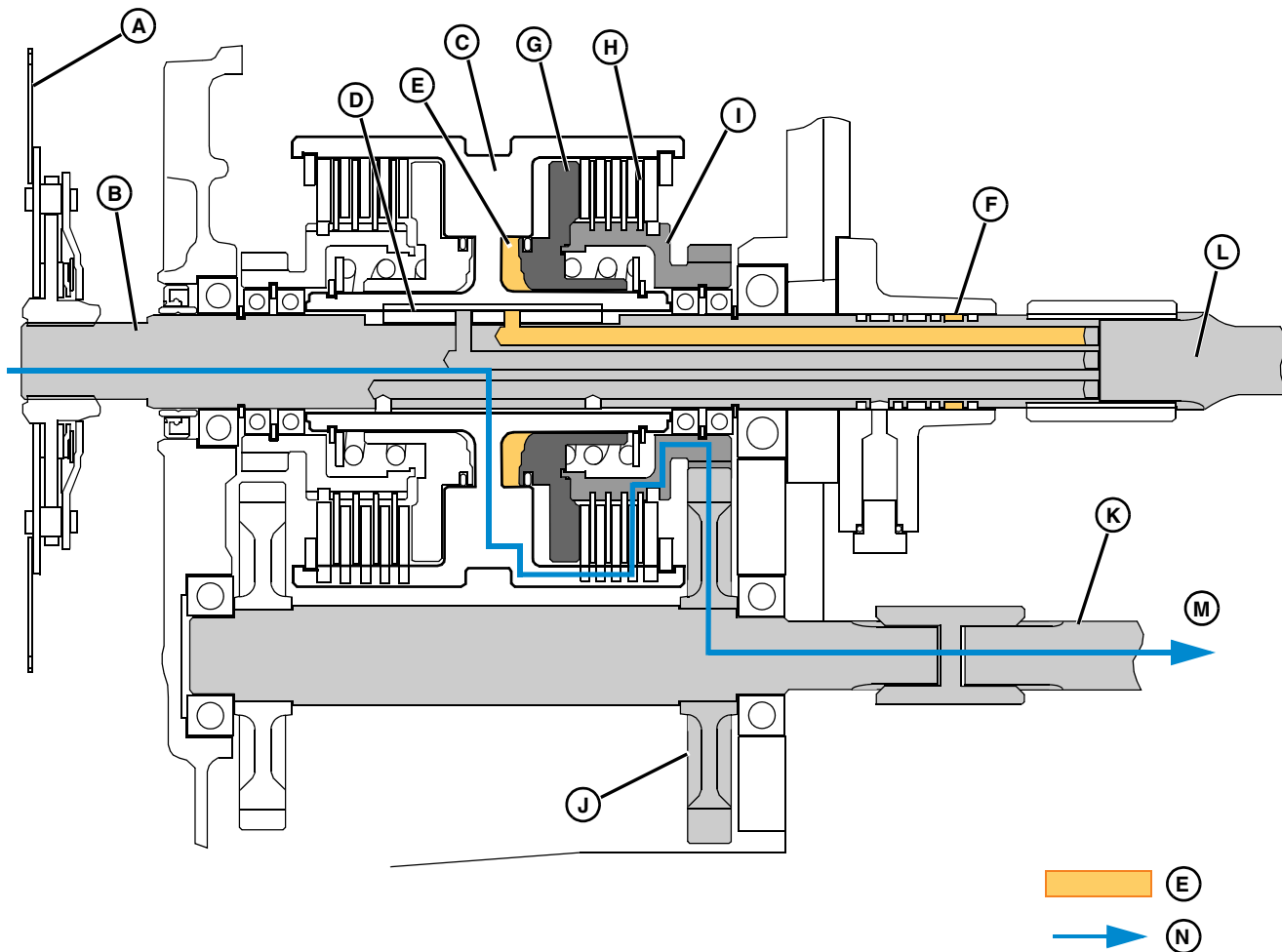
The damper disk (A) is bolted to the engine flywheel and splined to the input shaft (B). The input shaft is connected to the clutch cylinder (C) with a key (D). When the engine is running the clutch cylinder is rotating in the same direction and at the same rpm as the engine.

When the machine is placed in forward and the clutch is engaged with pressure oil (E) routed through the PRT valve to clutch cylinder through the manifold bolted on to the clutch case and through a hole (F) bored in the input shaft. See PRT Control Valve Operation “Lever In Forward, Clutch Pedal Up” on page 606.

The hydraulic oil forces the clutch piston (G) to press the clutch friction plates (H) together with the separator plates. The friction plates have tangs which fit into slots in the clutch cylinder. The separator plates are splined to the clutch gear (I). When the friction and separator plates are pressed together power is transferred from the clutch cylinder to the clutch gear.

The clutch gear teeth are engaged with the transfer shaft 45T gear (J) which is splined to the driven shaft (K) causing it to rotate. The driven shaft is connected to the 4 speed transmission using a coupler. (See [Transmission Operation](#) in Section 60, Group 15.)

Forward engagement of the PRT clutch causes the driven shaft to rotate in the opposite direction of the input shaft. It operates independently of the PTO shaft which is splined directly to the input shaft. The PTO shaft always operates in the same direction and speed of the engine flywheel.



PRT Clutch Operation—Forward

Continued on next page

SW03989,0000C37 -19-05NOV10-1/2

LVAL12081 —UN—16NOV10

Theory of Operation

A—Damper Disk	F—Bored Hole in The Input Shaft	I— Clutch Gear	M—To 4 Speed Transmision
B—Input Shaft	G—Clutch Piston	J— Transfer Shaft Gear, 45T	N—Power Flow
C—Clutch Cylinder	H—Clutch Friction Plates	K—Transfer Shaft	
D—Key		L—PTO Shaft	
E—Pressure Oil			

SW03989,0000C37 -19-05NOV10-2/2

PRT Clutch Operation—Reverse

Function:

To transfer power from the engine flywheel, through the clutch cylinder, idler gear, transfer shaft and then to the 4 speed transmission shaft to rotate the 4 speed transmission shaft in the same direction of the engine flywheel.

Theory of Operation:

The damper disk (A) is bolted to the engine flywheel and splined to the input shaft (B). The input shaft is connected to the clutch cylinder (C) with a key (D). When the engine is running the clutch cylinder is rotating in the same direction and at the same rpm as the engine.

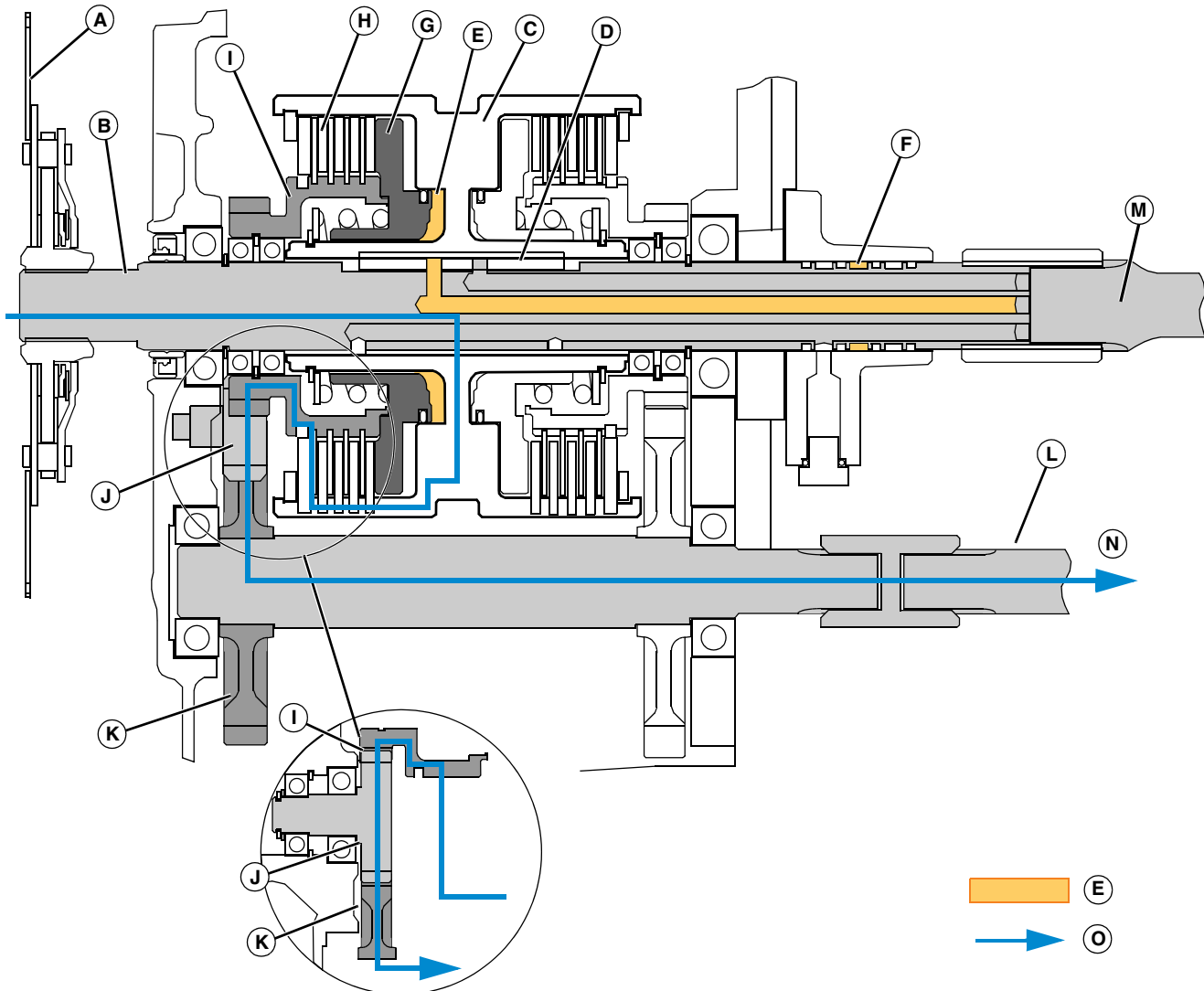
When the machine is placed in reverse and the clutch is engaged with hydraulic oil pressure routed through the PRT valve to clutch cylinder (E) through the manifold bolted on to the clutch case and through a hole (F) bored in the input shaft. (See PRT Control Valve Operation in

Section 60, Group 15.) And refer to “Lever In Reverse, Clutch Pedal Up”.

The hydraulic oil forces the clutch piston (G) to press the clutch friction plates (H) together with the separator plates. The friction plates have tangs which fit into slots in the clutch cylinder. The separator plates are splined to the clutch gear (I). When the friction and separator plates are pressed together power is transferred from the clutch cylinder to the clutch gear.

The clutch gear teeth are engaged with the idler gear (J) which is engaged with the transfer shaft 42T gear (K) which is splined to the drive shaft (L) causing it to rotate. The drive shaft is connected to the 4 speed transmission (M) using a coupler. (See Transmission Operation in Section 60, Group 15.)

Reverse engagement of the PRT clutch causes the driven shaft to rotate in the same direction of the input shaft. It operates independently of the PTO shaft which is splined directly to the input shaft. The PTO shaft always operates in the same direction and speed of the engine flywheel.



PRT Clutch Operation—Reverse

Continued on next page

SW03989,0000C38 -19-05NOV10-1/2

LVAL12092 —UN—16NOV10

Theory of Operation

- | | | | |
|-------------------|---------------------------------|----------------------------|---------------------------|
| A—Damper Disk | F—Bored Hole in The Input Shaft | I— Clutch Gear | M—To 4 Speed Transmission |
| B—Input Shaft | G—Clutch Piston | J— Idler Gear | N—PTO Shaft |
| C—Clutch Cylinder | H—Clutch Friction Plates | K—Transfer Shaft Gear, 42T | O—Power Flow |
| D—Key | | L— Drive Shaft | |
| E—Pressure Oil | | | |

SW03989,0000C38 -19-05NOV10-2/2

Transmission Operation

4 Speed Function:

To transfer power from the 4 speed shaft through the mid shaft to the pinion shaft at one of four different speed ratios.

4 Speed Theory of Operation:

When the PRT transmission is engaged in either forward or reverse, there is rotation of the driven shaft (A) going into the machine tunnel which is coupled to the 4 speed shaft (B).

Two synchromesh collars (C) are splined to the 4 speed shaft and can be shifted individually forward or backward to engage the 4 speed shaft to the mid shaft (D).

There are four corresponding gears on the mid shaft that are constantly meshed to the four gears on the 4 speed shaft. The four gears on the 4 speed shaft are mounted on roller bearings (E) and turn independently from the 4 speed shaft.

Power flow is shown below with the right synchromesh collar shifted to engage 1st gear. The 4 speed shaft transfers power through the 1st gear to the mid shaft which transfers power to the range gears of the pinion shaft (F). When the range transmission is shifted into a gear range (gear range A shown), the range shift collar connects the range gear to the pinion shaft causing the pinion shaft to rotate. Power is then transferred both rearward to the rear final drive and forward to the MFWD if engaged.

Range Transmission Function:

To transfer power from the pinion shaft to the rear axles.

Range Transmission Operation:

When the transmission is engaged, power from the driven shaft (A) is transferred through a splined coupler to the

4-speed gear shaft (B). The four gears on the shaft all spin freely on the shaft. Each of the four gears is engaged to a fixed gear on the mid shaft (D). There are two shift collars (C) on the gear shaft that can engage any one of the gears to the shaft. When one of them is engaged, the mid shaft rotates. See "Theory of Operation" in the PRT Power Train section.

All of the gears on the mid shaft are splined to the shaft and rotate any time one of the 4-speed gears is engaged. There are three gears on the mid shaft that are continuously engaged to three gears on the pinion shaft (F). The three gears on the pinion shaft spin freely on the shaft.

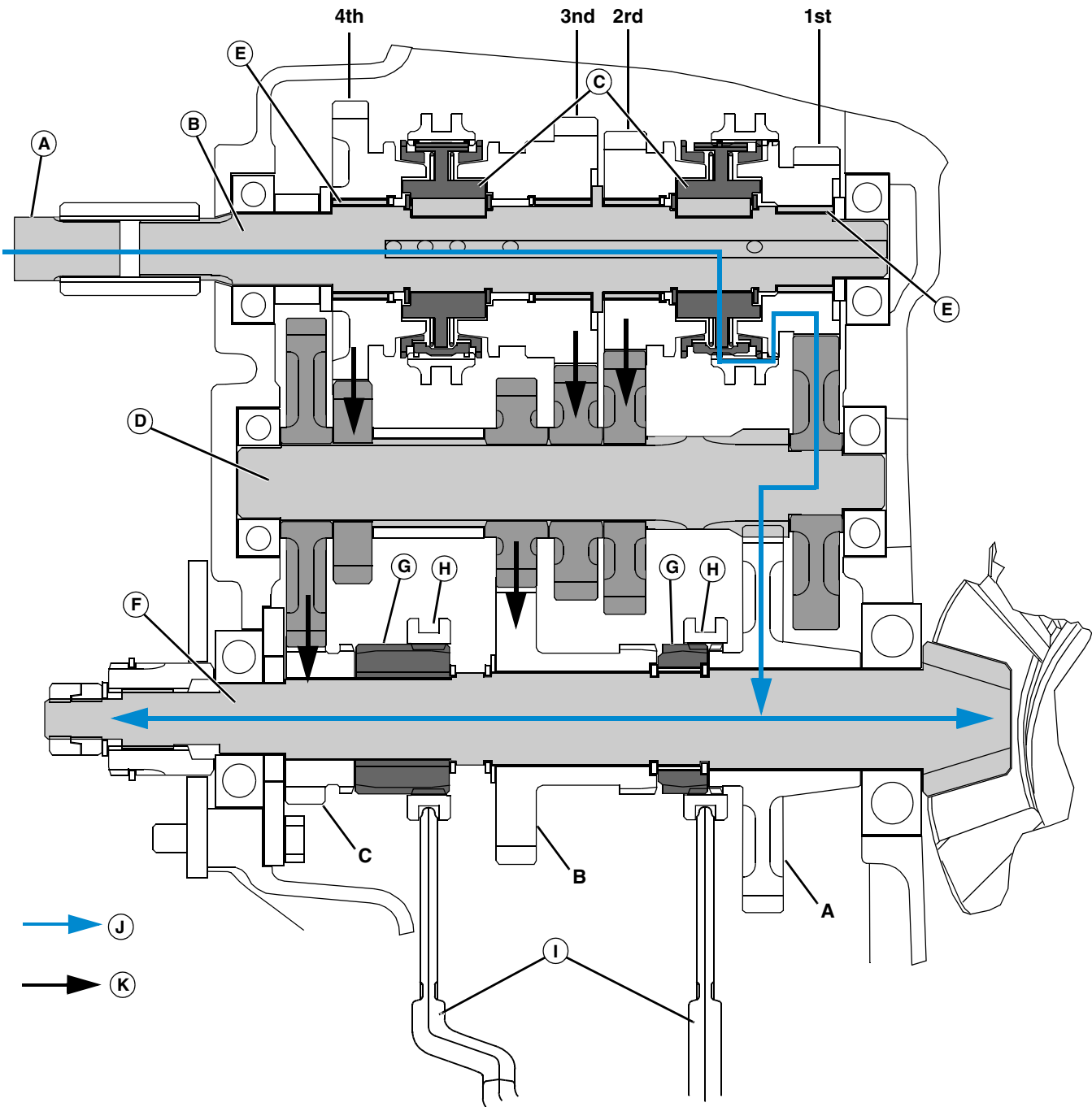
Between the three gears on the pinion shaft there are two splined sleeves (G). There are two shift collars (H) that slide forward and rearward on the splined sleeves.

The forks secured to the range shift linkage fit into the two shift collars and selection of the range shifter moves the forks and shift collars forward and rearward. The shift collars lock (only one at a time) the gears on the pinion shaft to one of the splined sleeves.

The diagram below shows the shifters in the rear most (A gear) position.

There are four positions for the shifters (from rear to front):

- Rear most—A
- Next forward—Neutral (no gear locked to sleeves)
- Next forward—B
- Most forward—C



Transmission Operation

LVAL12093 —UN—16NOV10

SW03989,0000C39 -19-05NOV10-2/2

A—Driven Shaft	D—Mid Shaft	I— Range Transmission Collar	K—Power Flow (other possible
B—4-Speed Gear Shaft	E—Roller Bearings	Positions (shown in A range	paths)
C—Syncromesh Collars (shown	F—Pinion Shaft	gear)	
in 1st gear)	G—Splined Sleeves	J— Power Flow (as described)	
	H—Shift Collars		

SW03989,0000C39 -19-05NOV10-3/2

PowrReverser™ (PRT) Power Train

- Engine Off

Test Conditions:

- Operator in Seat

NOTE: Roll the machine forward and reverse slightly while checking the shift functions.

Symptom	Problem	Solution
Shift Lever and Clutch Pedal Checks	Speed transmission shift lever does not move freely and detent in all positions.	If rolling the machine forward and reverse to release the pressure on the gears does not allow for the shift lever to move freely and detent fully, (See Transmission Gear Set Removal and Installation in Section 60, Group 35.)
	Range transmission shift lever does not move freely and detent in all positions.	If rolling the machine forward and reverse to release the pressure on the gears does not allow for the shift lever to move freely and detent fully, (See Transmission Gear Set Removal and Installation in Section 60, Group 35.)
	PRT shift lever does not move freely and detent in all positions.	Check shift lever detent in shift/clutch valve. (See PRT Shift/Clutch Valve Removal and Installation in Section 60, Group 35.)
	Clutch pedal does not press and return freely.	Check for broken return springs or debris or damage to pedal and/or clutch pedal shaft. (See PRT Clutch Pedal and Linkage Removal and Installation in Section 60, Group 35.)

Test Conditions:

- Operator in Seat
- Engine Running at 2000 rpm

- Park Brake Unlocked
- Speed Transmission in 1st Gear
- Range Transmission in A Gear

Symptom	Problem	Solution
Machine Movement	With the control lever in Neutral and the clutch released, machine creeps.	Adjust linkage. (See PRT Clutch Linkage Adjustment and Test in Section 60, Group 30.)
	With the control lever in Forward and the clutch pressed down, machine creeps.	Adjust linkage. (See PRT Clutch Linkage Adjustment and Test in Section 60, Group 30.)
	With the control lever in Reverse and the clutch pressed down, machine creeps.	Adjust linkage. (See PRT Clutch Linkage Adjustment and Test in Section 60, Group 30.)
	With the control lever in Forward and the clutch pedal released, machine does not move smoothly forward.	See "Troubleshooting" below.
	With the control lever in Reverse and the clutch pedal released, machine does not move smoothly rearward.	(See Troubleshooting in Section 60, Group 25.)

Test Conditions:

Continued on next page

SW03989,0000C3A -19-14FEB11-1/2

- Operator in Seat
- Engine Running at 2000 rpm
- Park Brake Locked
- Speed Transmission in 4th Gear
- Range Transmission in C Gear
- PRT Shift Lever in Forward

Safely support rear axle to suspend rear wheels off of ground.

Disengage MFWD.

With the control lever in Forward and the clutch pressed down, with the engine at 2000 rpm, release the clutch pedal quickly and check that the engine stalls quickly

If the engine does not stall, adjust linkage. (See PRT Clutch Linkage Adjustment and Test in Section 60, Group 30.)

SW03989,0000C3A -19-14FEB11-2/2

PowrReverser (PRT) Troubleshooting

Symptom	Problem	Solution
Poor PowrReverser (PRT) Performance	Poor Transmission Performance.	Parking brake is on or misadjusted.
		Low hydraulic fluid level.
		Plugged screens filter.
		Clutch linkage misadjusted.
		Loss of charge pressure.
		Oil leakage within the valve body.
		Worn drive clutch pack.
		Ballast and/or tow load too heavily.
		Damaged gear(s).
	Complete Loss of Transmission Power.	Low hydraulic fluid level.
		Loss of charge pressure.
		Failure of valve body.
		Failure of high-pressure components in pump.
		Failure of drive clutch.
		Mechanical failure at gearbox or drive line.
	Machine Creeps In Neutral.	Clutch linkage misadjusted.
		Forward/Reverse valve is leaking.
		Drive clutch stuck or binding.
	Machine Does Not Move in Forward.	Low hydraulic fluid level.
		PRT shift lever worn, bend, or broken.
		Oil leakage within the valve body.
		Oil leakage within the drive clutch pack.
		Worn drive clutch pack.

Continued on next page

SW03989,0000C3B -19-12NOV10-1/2

Symptom	Problem	Solution
		Drive clutch stuck or binding.
		Forward/Reverse valve is stuck or leaking.
		Mechanical failure at gearbox or drive line.
	Machine Does Not Move in Reverse.	Low hydraulic fluid level.
		PRT shift lever worn, bend, or broken.
		Oil leakage within the valve body.
		Oil leakage within the drive clutch pack.
		Worn drive clutch pack.
		Drive clutch stuck or binding.
		Forward/Reverse valve is stuck or leaking.
		Mechanical failure at gearbox or drive line.
	Loss of Charge Pressure.	Engine speed too low to develop required charge flow.
		Inefficient charge pump not providing required flow.
		Charge flow diverted to hydro (steering, PTO, and other components).
		Extreme temperature increases demand but reduces flow.
		Reduction in hydro efficiency increases charge flow demand.
		Cut or worn seal ring on servo piston.
		Leakage past the charge pressure relief valve.

SW03989,0000C3B -19-12NOV10-2/2

PRT Clutch Linkage Adjustment and Test

Reason:

To ensure that forward and reverse clutches engage fully when the clutch pedal is against the up stop, and disengages fully when the clutch pedal is against the down stop.

Pedal Up and Down-Stop Adjustment:

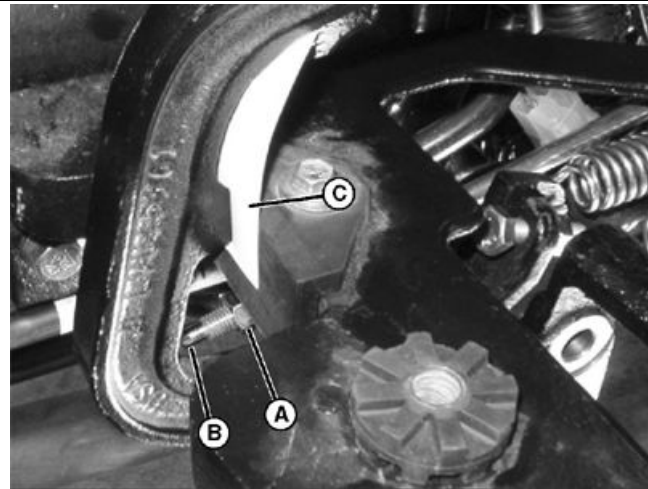
IMPORTANT: Avoid Damage! Clutch pedal travel must be stopped by the up stop and down stop. If clutch pedal travel is stopped by the valve lever travel, damage to the PRT control valve may result.

NOTE: If clutch linkage is removed or replaced, set initial pushrod length to specification before installation.

1. Park machine safely with the range shift and speed shift transmission levers in NEUTRAL.

NOTE: Turn the clutch link clockwise to lengthen and counter-clockwise to shorten the clutch link.

2. Loosen the jam nut (A) and adjust the clutch link (B) so that the clutch pedal is making contact with the rubber up-stop.
 - a. Trap a piece of paper (C) between the pedal and the rubber up-stop.
 - b. Slowly adjust the clutch link (B) and gently pull on the paper until it slips out. Stop adjusting as soon as the paper will slip out.



Clutch Pedal Adjustment (operator platform removed for clarity)

A—Jam Nut
B—Clutch Link

C—Paper

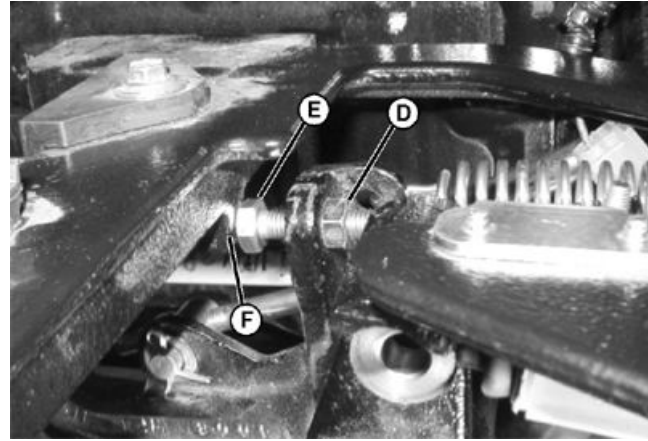
- c. Turn the clutch link 1-1/2 turns counter-clockwise (shorter).
- d. Hold the clutch link in position and tighten the jam nut (A).

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MM61211,00000C4 -19-10NOV10-1/3

3. Loosen the jam nut (D) on the pedal down-stop screw (E).
 - a. Screw the pedal down-stop screw (E) all the way in to allow the maximum possible pedal down stroke.
 - b. Depress the clutch pedal by hand until it stops (valve lever at maximum travel).
 - c. Continue holding the pedal in the down position and screw out the pedal down-stop screw until it reaches the down stop (F).
 - d. Release the clutch pedal.
 - e. Screw the pedal down-stop screw out another two full turns and tighten the jam nut.
4. Test the clutch adjustment.



Clutch Pedal Adjustment Procedure (operator platform removed for clarity)

D—Jam Nut
E—Pedal Down-Stop Screw
F—Down Stop

Specification

Clutch Link
Preset—Length..... 232 mm (9.134 in.)

Clutch Test Procedure:

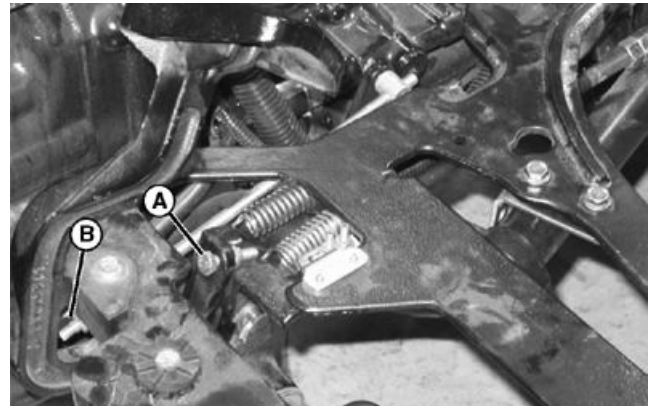
1. Park machine safely with the range shift and speed shift transmission levers in NEUTRAL.
2. Adjust the brake pedals and park brake before checking clutch adjustment. (See [Brake Adjustment](#) and [Parking Brake Adjustment](#) in Section 110, Group 25.)
3. Locate PRT clutch linkage under left foot rest.
4. Check initial adjustment by adjusting for creep.
 - a. Safely support rear axle to suspend rear wheels off of ground.
 - b. Disengage MFWD.
 - c. Unlock park brake.

- d. Place the PRT shift lever in forward.
- e. Depress and hold the clutch pedal and place the transmission in gear position A-1.
- f. With the engine at 2000 rpm and the clutch pedal depressed, rear wheels should not rotate.
- g. Depress and hold the clutch pedal and shift the transmission to gear position C-4.
- h. Lock the park brake.
- i. With the engine at 2000 rpm, release the clutch pedal quickly and check that the engine stalls quickly.

MM61211,00000C4 -19-10NOV10-2/3

Results:

- With the transmission in gear position A-1 and the clutch depressed, the wheels should not turn.
- If the wheels turn, adjust the down stop screw (A) (shorter) counting the flats of the hex head, until wheels stop turning.
- Do not adjust more than twelve total flats (2 full turns).
- With the transmission in gear position C-4, the engine should stall when the clutch pedal is released with the park brake set.
- If the engine continues to run, adjust clutch link (B) (longer) 1/2 turn at a time and retest for engine stall.
- Do not adjust more than 1-1/2 turns.
- If desired results cannot be obtained, verify correct function by performing hydraulic pressure test. (See [PRT Hydraulic Pressure Tests](#) in Section 60, Group 30.)



Clutch Pedal Adjustment Results (operator platform removed for clarity)

A—Down Stop Screw
B—Clutch Link

MM61211,00000C4 -19-10NOV10-3/3

PRT Hydraulic Pressure Tests

Reason:

To ensure that forward and reverse clutches engage fully, and to prevent clutch slippage which may result in damage to clutch and reduced ground speed.

NOTE: Be sure front gear pump is in good working order and strainer in inlet port is clean. Check PRT shift lever linkage adjustment before performing PRT hydraulic pressure tests.

Special or Required Tools:

- JTO 3349 Adapter
- JTO 3017 Hose
- JTO 3344 Gauge

Procedure (Forward and Reverse Pressure):

1. Park machine safely. Engage park brake.
2. Place range shift and speed shift transmission levers in NEUTRAL.
3. On left side of machine, below the clutch pedal, locate the PRT transmission valve.
4. Remove forward clutch pressure test port (A) plug and install test equipment.
5. Push in clutch pedal.

NOTE: Make sure range shift and speed shift are in Neutral.

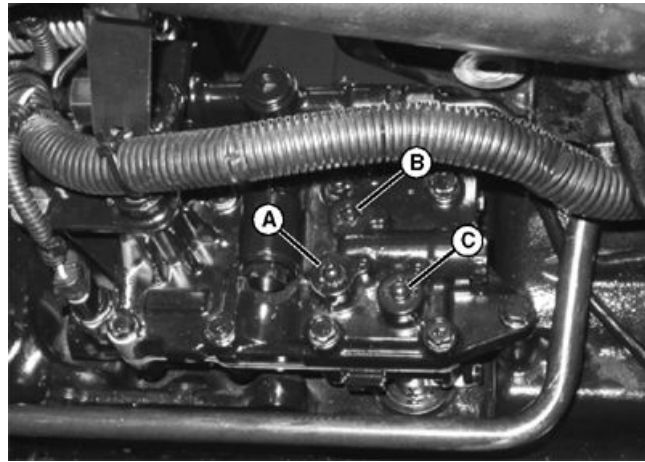
6. Start engine.
 - Place F-N-R lever in Forward.
 - Release clutch pedal.
7. Allow two seconds for modulation valve to fully open. Check pressure reading on gauge and record result.
8. Shut off engine.

NOTE: When reinstalling test port plugs, seal threads using TEFLON™ tape.

9. Remove test equipment and install test port plug.
10. Remove reverse clutch pressure test port (C) plug and install test equipment.
11. Push in clutch pedal.

NOTE: Make sure range shift and speed shift are in Neutral.

12. Start engine.
 - Place F-N-R lever in Reverse.
 - Release clutch pedal.
13. Allow two seconds for modulation valve to fully open. Check pressure reading on gauge and record result.
14. Shut off engine.



Test Ports

- A—Forward Clutch Pressure Test Port C—Reverse Clutch Pressure Test Port
B—Lubrication Oil Pressure Test Port

NOTE: When reinstalling test port plugs, seal threads using TEFLON™ tape.

15. Remove test equipment and install test port plug.

Results:

Pressure on gauge should reach specification after 2 seconds with the pedal released (up).

Pressure on gauge should be less than specification with the pedal pressed down fully.

	Specification
Gauge Reading	
2 Seconds with Pedal Released	
(Up)—Pressure.....	1792 — 2000 kPa (260 — 290 psi)
Gauge Reading with Pedal Pressed Down	
Fully—Pressure (Less Than).....	207 kPa (30 psi)

- If low oil pressures (pedal pressed down) is too high:
- Decrease length of PRT clutch threaded link. (See [PRT Clutch Linkage Adjustment and Test](#) in Section 60, Group 30.)
- If high oil pressures are too low:
- Check oil filter and PRT valve hydraulic oil input filter screen for blockage.
- Measure steering pressure. (See [Steering Pressure Check](#) in Section 100, Group 25.) If steering pressure is good and filters are clear, increase length of PRT clutch threaded link. (See [PRT Clutch Linkage Adjustment and Test](#) in Section 60, Group 30.)
- If high oil pressure (pedal released) remains low:
- PRT valve may have internal leakage. (See [PRT Shift/Clutch Valve Removal and Installation](#) in Section 60, Group 35.)

Continued on next page

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LVAL12097 —UN—29OCT10

- Seals/gaskets on clutches or drive shaft may be leaking. (See PRT Traction Clutch Disassembly and Assembly in Section 60, Group 35.)

Procedure (Lubrication Pressure):

1. Park machine on a level surface and engage park brake.
2. Place range shift and speed shift transmission levers in NEUTRAL.
3. Remove lubrication oil pressure test port (B) plug and install test equipment.
4. Push in clutch pedal. Start engine.
5. Place forward/reverse (directional) shift lever in FORWARD or REVERSE. Release clutch pedal.

TEFLON is a trademark of Du Pont Co.

6. Check pressure reading on gauge and record result.
7. Shut off engine.

NOTE: When reinstalling test port plugs, seal threads using TEFLON™ tape.

8. Remove test equipment and install test port plug.

Results:

- If lubrication pressure is low, PRT clutch valve may need to be adjusted, lube oil relief valve may be malfunctioning. (See PRT Clutch Linkage Adjustment and Test in Section 60, Group 30.) or (see PRT Shift/Clutch Valve Removal and Installation in Section 60, Group 35.)

SW03989,0000C3D -19-14FEB11-2/2

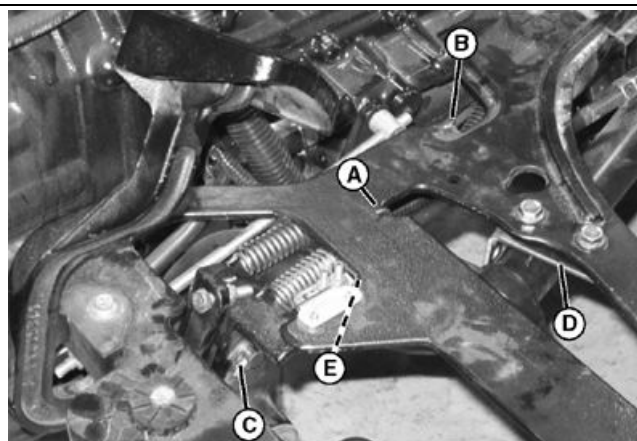
PRT Clutch Pedal and Linkage Removal and Installation

Removal:

1. Park machine safely on a level surface with park brake locked.
2. Disconnect battery negative cable from battery.
3. Remove rear fenders, if desired, to ease operator platform removal. (See Rear Fenders Removal and Installation in Section 120, Group 10.)
4. Remove seat and seat support. (See Seat and Seat Support Removal and Installation in Section 120, Group 10.)
5. Remove seat closeout panel. (See Seat Closeout Removal and Installation in Section 120, Group 10.)
6. Remove fuse panel cover. (See Fuse Panel Cover Removal and Installation in Section 120, Group 10.)
7. Remove operator platform. (See Operator Platform Removal and Installation in Section 120, Group 10.)

CAUTION: Avoid Injury! Springs are installed under tension. Use caution when attaching or disconnecting springs. Wear eye protection.

8. Remove the left brake return spring (A) and the clutch pedal spring (B).



Left Brake Return Spring

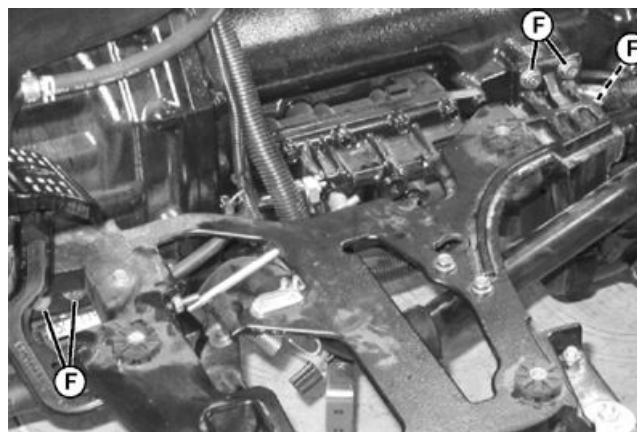
A—Left Brake Return Spring
B—Clutch Pedal Spring
C—Brake Rod at Bellcrank
D—Support Bracket
E—Electrical Connector

9. Remove the cotter pin and washer from the brake rod at the bellcrank (C).
10. Remove the two cap screws and nuts securing support bracket (D) to foot deck support.
11. Disconnect the electrical connector (E) attaching wiring harness to brake switch if equipped.

SW03989,0000E33 -19-14FEB11-1/7

12. Remove the five cap screws (F) securing the left foot deck support and remove the support.

F—Cap Screw (5 used)



Left Foot Deck Support

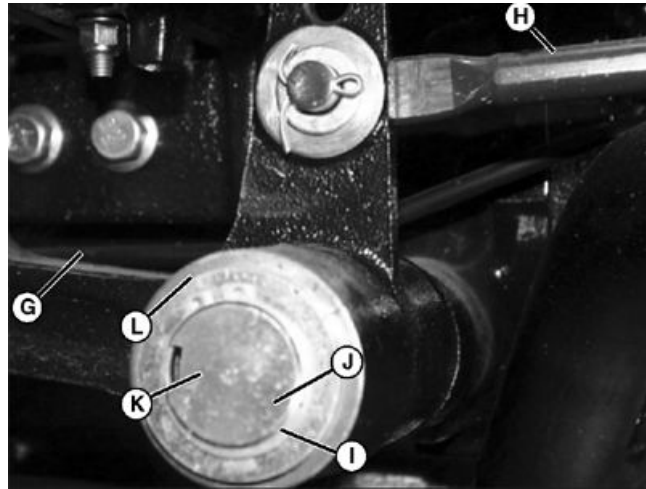
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SW03989,0000E33 -19-14FEB11-2/7

13. Remove the cotter pin and washer from the clutch link swivel on the clutch pedal (G) and the valve lever (H). Remove the clutch link.
14. Remove the snap ring (I) and washer (J) from the end of the pedal shaft.
15. Remove the left brake bell crank (K), key, and clutch pedal (L) from the pedal shaft.
16. If needed, the swivels may be removed from the clutch link.

G—Clutch Link Swivel On
Clutch Pedal
H—Valve Lever
I—Snap Ring

J—Washer
K—Left Brake Bellcrank
L—Clutch Pedal



Clutch Link Swivel

SW03989,0000E33 -19-14FEB11-3/7

LVAL12100 —UN—29OCT10

Installation:

NOTE: The valve swivel has left-hand threads and is marked by an "L" (M).

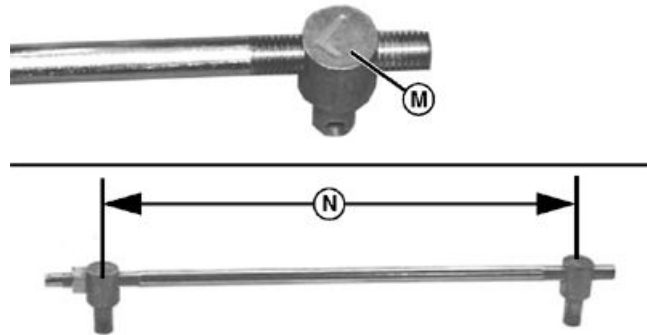
1. Install the valve swivel on the clutch link. Center the swivel on the threads.
2. Install the clutch pedal swivel on the clutch link. Center the swivel on the threads.

NOTE: Preset clutch link length to specification before installation.

3. Hold the swivels in place and screw the rod to adjust the distance from swivel centers (N) to specifications. Snug but do not tighten the jam nut to the clutch swivel.

Specification

Clutch Swivel
Adjustment—Length..... 232 mm (9.134 in.)



Valve Swivel

M—"L" (left-hand thread)

N—Distance From Swivel
Centers

Continued on next page

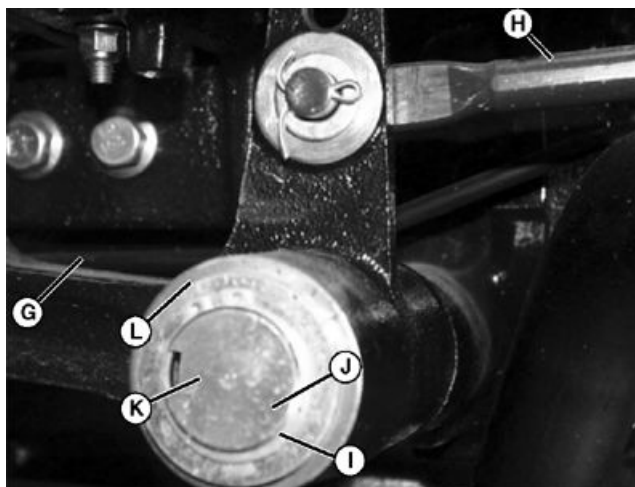
SW03989,0000E33 -19-14FEB11-4/7

LVAL12101 —UN—29OCT10

4. Install the clutch pedal (L) then the key and left brake bellcrank (K) onto the pedal shaft.
5. Install the washer (J) and snap ring (I) to the end of the pedal shaft.
6. Install the clutch link with the swivel marked with the letter "L" into the valve lever (H) and the swivel with the jam nut and adjustment slot into the clutch pedal (G). Install the washer and cotter pin to each swivel.

G—Clutch Link Swivel On
Clutch Pedal
H—Valve Lever
I— Snap Ring

J— Washer
K—Left Brake Bellcrank
L— Clutch Pedal

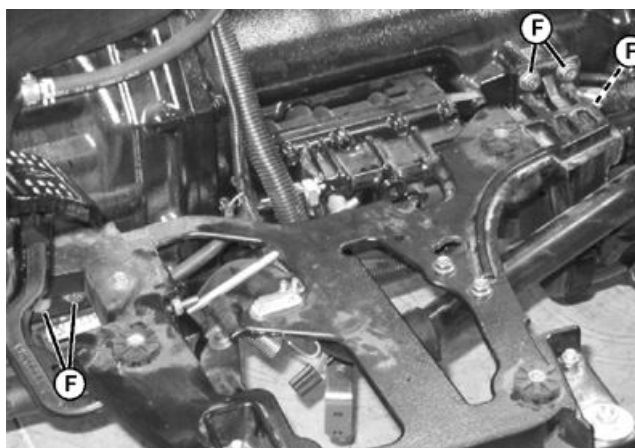


LVAL12102—UN—29OCT10

SW03989,0000E33 -19-14FEB11-5/7

7. Install the left foot deck support and secure with five cap screws (F).

F— Cap Screw (5 used)



LVAL12103—UN—29OCT10

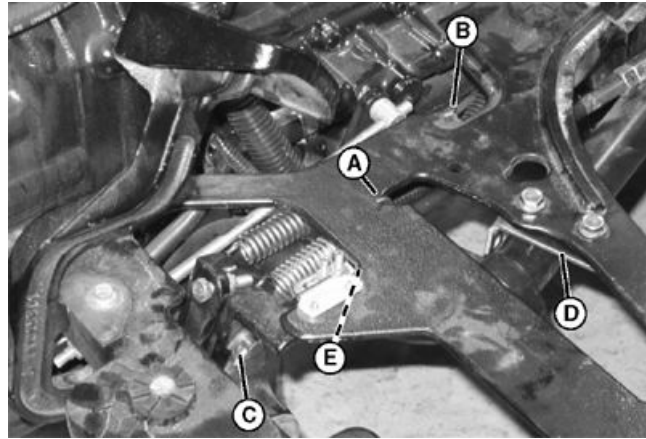
Left Foot Deck Support

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SW03989,0000E33 -19-14FEB11-6/7

⚠ CAUTION: Avoid Injury! Springs are installed under tension. Use caution when attaching or disconnecting springs. Wear eye protection.

8. Install the left brake return spring (A) and the clutch pedal spring (B).
9. Install the brake rod to the left brake bellcrank and secure with washer and cotter pin (C).
10. Install the support bracket (D) to foot deck support and secure with two cap screws and nuts.
11. Connect the electrical connector (E) attaching wiring harness to brake switch if equipped.
12. Adjust clutch pedal. (See PRT Clutch Linkage Adjustment and Test in Section 60, Group 30.)
13. Install operator platform. (See Operator Platform Removal and Installation in Section 120, Group 10.)
14. Install fuse panel cover. (See Fuse Panel Cover Removal and Installation in Section 120, Group 10.)
15. Install seat closeout panel. (See Seat Closeout Removal and Installation in Section 120, Group 10.)
16. Install seat and seat support. (See Seat and Seat Support Removal and Installation in Section 120, Group 10.)
17. Install rear fenders, if desired, to ease operator platform removal. (See Rear Fenders Removal and Installation in Section 120, Group 10.)



Left Brake Return Spring

A—Left Brake Return Spring D—Support Bracket
 B—Clutch Pedal Spring E—Electrical Connector
 C—Brake Rod at Bellcrank

18. Connect battery negative cable to battery.

Specification

Clutch Link
 Preset—Length..... 232 mm (9.134 in.)

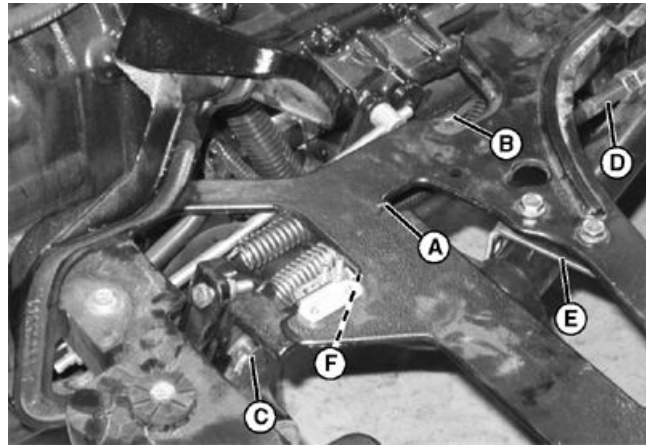
LVAL12104—UN—29OCT10

SW03989,0000E33 -19-14FEB11-7/7

PRT Shift/Clutch Valve Removal and Installation

Removal:

1. Park machine on a level surface. Block wheels to keep machine stationary.
 2. Disconnect battery negative cable from battery.
 3. Remove rear fenders, if desired, to ease operator platform removal. (See Rear Fenders Removal and Installation in Section 120, Group 10.)
 4. Remove seat and seat support. (See Seat and Seat Support Removal and Installation in Section 120, Group 10.)
 5. Remove seat closeout panel. (See Seat Closeout Removal and Installation in Section 120, Group 10.)
 6. Remove fuse panel cover. (See Fuse Panel Cover Removal and Installation in Section 120, Group 10.)
 7. Remove operator platform. (See Operator Platform Removal and Installation in Section 120, Group 10.)
- ⚠ CAUTION: Avoid Injury! Springs are installed under tension. Use caution when attaching or disconnecting springs. Wear eye protection.**
8. Remove the left brake return spring (A) and the clutch pedal spring (B).



Left Brake Return Spring

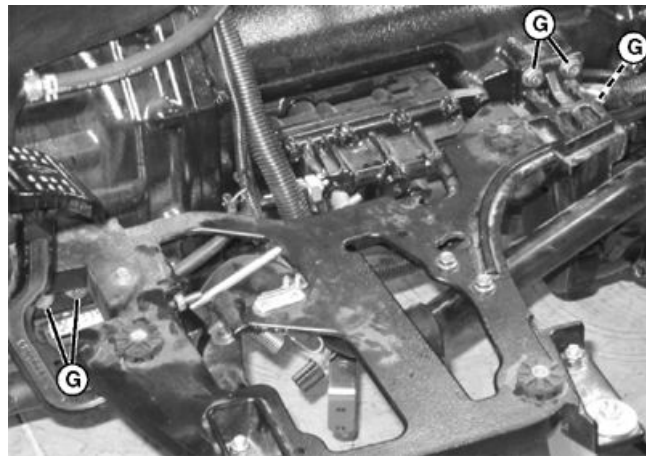
A—Left Brake Return Spring D—Brake Link
B—Clutch Pedal Spring E—Support Bracket
C—Cotter Pin And Washer F—Electrical Connector

9. Remove the cotter pin and washer (C) from each end of the brake link (D) and remove the link.
10. Remove the two cap screws and nuts securing support bracket (E) to foot deck support.
11. Disconnect the electrical connector (F) attaching wiring harness to brake switch if equipped.

SW03989,0000E34 -19-14FEB11-1/15

12. Remove the five cap screws (G) securing the left foot deck support and remove the support.

G—Cap Screw (5 used)



Left Foot Deck Support

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SW03989,0000E34 -19-14FEB11-2/15

13. Remove the cotter pin and washer (H) and disconnect the clutch linkage from the PowrReverser™ valve clutch lever.

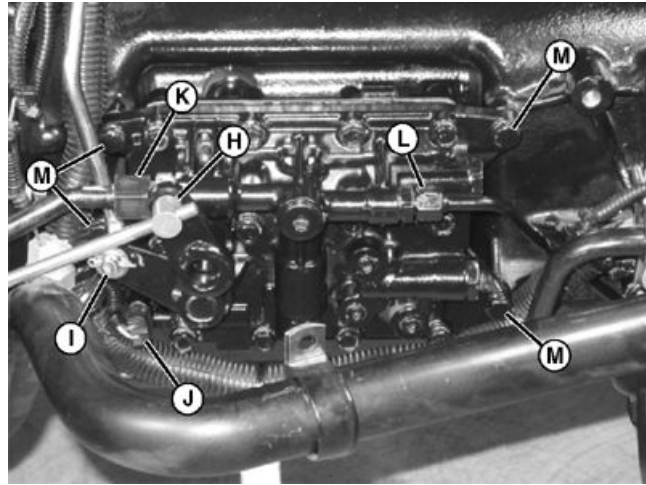
14. Remove the cotter pin and washer (I) and disconnect the shift linkage from the PowrReverser™ valve shift lever.

15. Disconnect transmission neutral switch wiring harness connector (J).

NOTE: Hydraulic lines will have oil in them. Have a suitable container ready to catch oil.

16. Disconnect hydraulic input line (K) to PowrReverser™ valve and the hydraulic pressure line (L) to the PTO valve.

17. Remove four cap screws (M) and PowrReverser™ valve from transmission case.



Clutch Linkage

H—Cotter Pin and Washer
I—Cotter Pin and Washer
J—Transmission Neutral Switch Wiring Harness Connector

K—Hydraulic Input Line
L—Hydraulic Pressure Line
M—Cap Screw (4 used)

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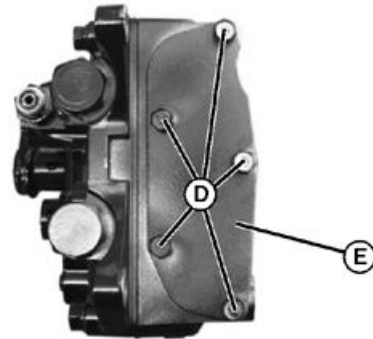
SW03989,0000E34 -19-14FEB11-3/15

Disassembly and Assembly:

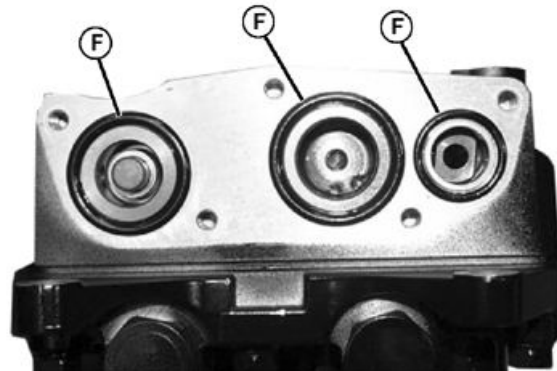
1. Remove five cap screws (D), side plate (E), and packing O-rings (F) from PowrReverser™ valve. Replace O-rings before reassembly.

D—Cap Screw (5 used)
E—Side Plate

F—O-Ring



PowrReverser Valve



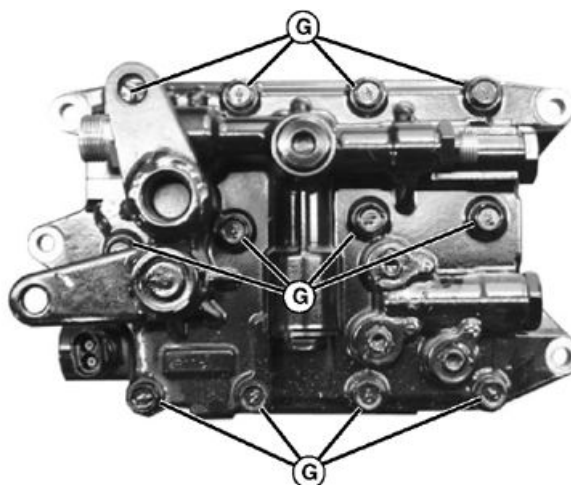
PowrReverser Valve O-Rings

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SW03989,0000E34 -19-14FEB11-4/15

2. Remove twelve cap screws (G) and securing PowrReverser™ valve case halves.

G—Cap Screw (12 used)



PowrReverser Valve Case Halves

LVAL12110 —UN—29OCT10

SW03989,0000E34 -19-14FEB11-5/15

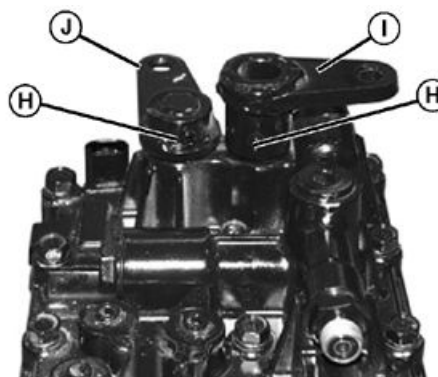
3. With appropriate punch, drive out spring pins (H) from clutch arm (I) and shift arm (J) and remove arms.

NOTE: Shift spool detent spring and ball may fall out when PowrReverser™ blocks are separated.

4. Separate PowrReverser™ blocks, separator plate and gaskets.

H—Spring Pin
I—Clutch Arm

J—Shift Arm



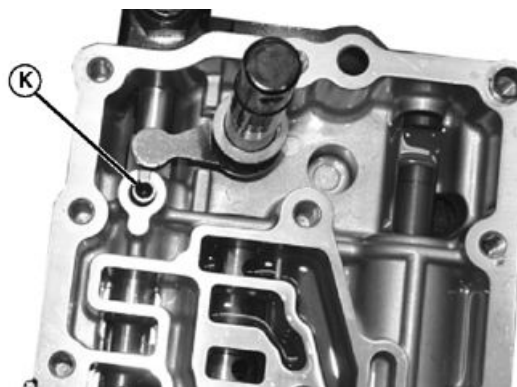
Clutch Arm and Shift Arm

LVAL12111 —UN—29OCT10

SW03989,0000E34 -19-14FEB11-6/15

5. Remove shift spool detent spring (K) and ball.

K—Shift Spool Detent Spring



Shift Spool Detent Spring

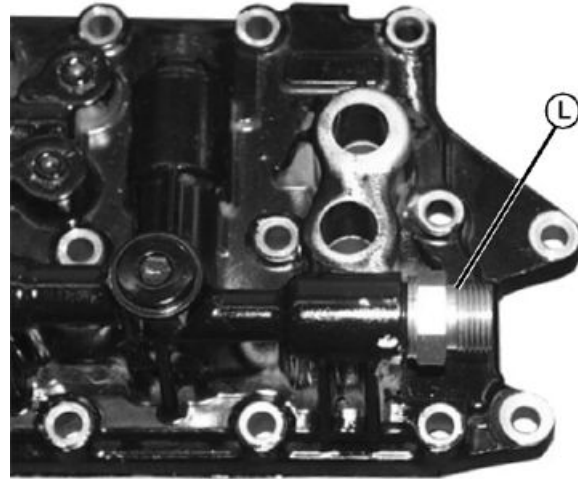
LVAL12112 —UN—29OCT10

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SW03989,0000E34 -19-14FEB11-7/15

6. Remove hydraulic inlet fitting (L).

L—Hydraulic Inlet Fitting



Hydraulic Inlet Fitting

LVAL12113—UN—29OCT10

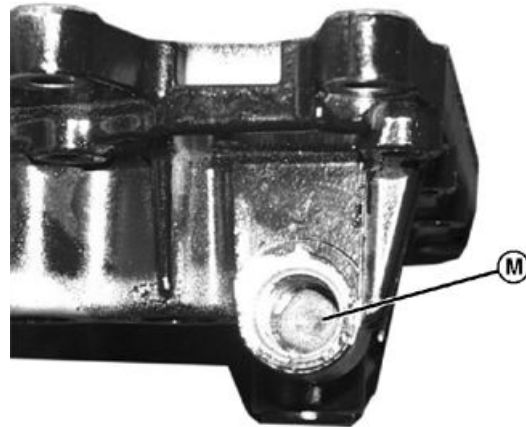
SW03989,0000E34 -19-14FEB11-8/15

NOTE: If inlet screen is torn or damaged beyond repair, replace entire inlet case.

7. Inspect hydraulic oil input port filter strainer (M) for debris and to ensure mesh in strainer is intact. Clean screen by removing fitting (N) and blowing compressed air in direction shown through channel on opposite side of screen.

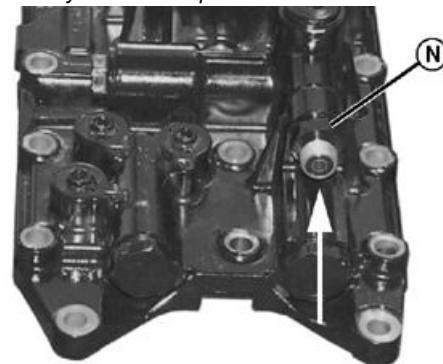
M—Hydraulic Oil Input Port
Filter Strainer

N—Fitting



Hydraulic Oil Input Port Filter Strainer

LVAL12114—UN—29OCT10



Fitting

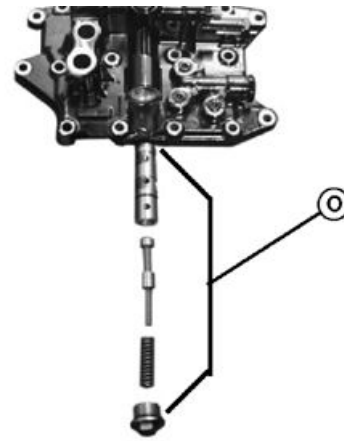
LVAL12115—UN—29OCT10

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SW03989,0000E34 -19-14FEB11-9/15

8. Remove pressure valve (O) from inlet case.
9. Inspect pressure valve parts for scratching or other signs of wear. Replace as necessary.
10. Clean pressure valve parts, lightly coat with clean hydraulic oil, and reassemble valve.

O—Pressure Valve



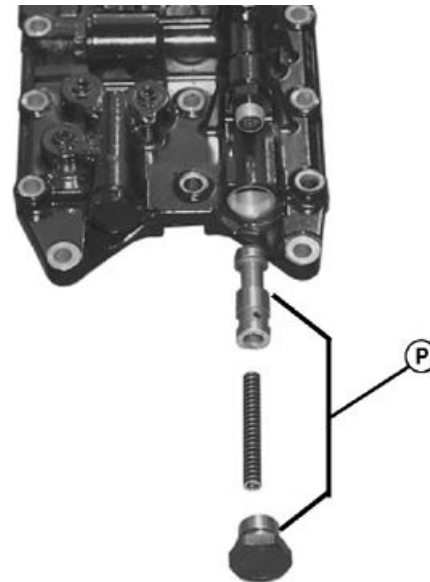
Pressure Valve

LVAL12116 —UN—29OCT10

SW03989,0000E34 -19-14FEB11-10/15

11. Remove cut off valve (P) from inlet case.
12. Inspect cut off valve parts for scratching or other signs of wear. Replace as necessary.
13. Clean cut off valve parts, lightly coat with clean hydraulic oil, and reassemble valve.

P—Cut Off Valve



Cut Off Valve

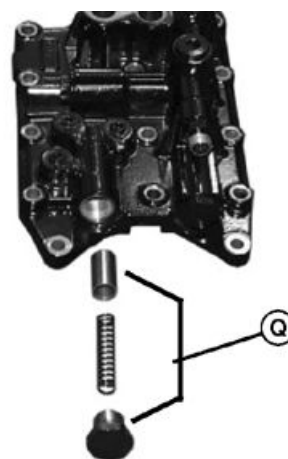
LVAL12117 —UN—29OCT10

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SW03989,0000E34 -19-14FEB11-11/15

14. Remove pressure relief valve (Q) from inlet case.
15. Inspect pressure relief valve parts for scratching or other signs of wear. Replace as necessary.
16. Clean pressure relief valve parts, lightly coat with clean hydraulic oil, and reassemble valve.

Q—Pressure Relief Valve



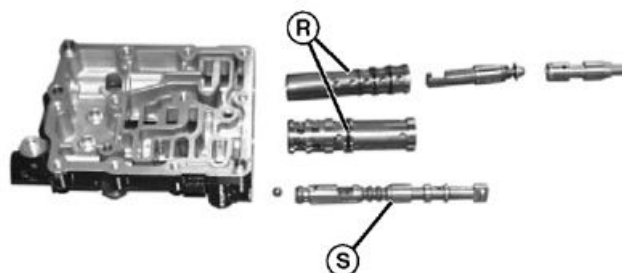
Pressure Relief Valve

LVAL12118 —UN—29OCT10

SW03989,0000E34 -19-14FEB11-12/15

17. Slide out valve assemblies (R) and shift spool (S). Inspect for scratching or other signs of wear.

R—Slide Out Valve Assembly S—Shift Spool



Slide Out Valve Assembly

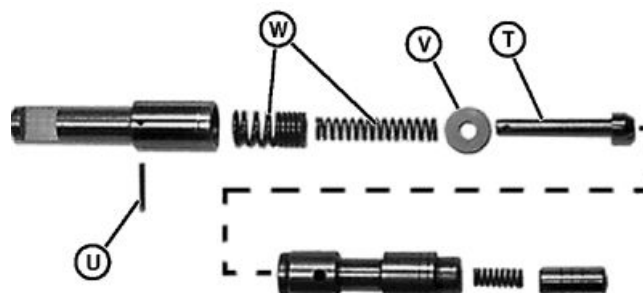
LVAL12119 —UN—29OCT10

SW03989,0000E34 -19-14FEB11-13/15

18. Separate clutch valve assembly halves. Depress spool guide pin (T), and remove insert pin (U).
19. Remove guide pin, spring retention washer (V) and springs (W) from valve half.
20. Inspect clutch valve parts for scratching or other signs of wear. Replace as necessary.
21. Clean clutch valve parts, lightly coat with clean hydraulic oil, and reassemble valve.

**T—Spool Guide Pin
U—Insert Pin**

**V—Guide Pin, Spring Retention Washer
W—Springs (Qty. 2)**



Clutch Valve Assembly

LVAL12120 —UN—29OCT10

Continued on next page

SW03989,0000E34 -19-14FEB11-14/15

22. Remove snap rings (X) from inside of drive spool.
23. Remove spring pin (Y) securing relief valve (Z) inside drive spool.
24. Inspect relief valve surfaces for scratching or other signs of wear. Replace as necessary.
25. Inspect drive valve (AA) surfaces for scratching or other signs of wear. Replace as necessary.
26. Inspect three nested springs (AB).
27. Clean relief valve parts, lightly coat with clean hydraulic oil and reassemble.
28. Clean PowrReverser™ blocks and separator plate in solvent and dry with compressed air.
29. Replace O-rings on drive spool.
30. If not already done, remove shift arm and clutch arm. Replace O-rings on shift and clutch arm shafts.
31. Install shift arm and clutch arm shafts.
32. Lightly coat all internal parts with clean hydraulic oil, reassemble spools and insert into PowrReverser™ block.
33. Install new O-rings and secure spool cover plate with lock washers and cap screws. Tighten cap screws securing cover plates to specification.

Specification

Spool Cover Plate Cap	
Screw—Torque.....	26 N·m (21 lb-ft)

34. Install detent assembly from outside of block and tighten detent ball plug to specification.

Specification

Detent Ball	
Plug—Torque.....	19 N·m (14 lb-ft)

35. Install new gaskets between PowrReverser™ cases and secure cases together with twelve cap screws and lock washers. Tighten cap screws to specification.

Specification

Case Cap	
Screw—Torque.....	24.4 N·m (18 lb-ft)



Drive Spool

X—Snap Ring
Y—Spring Pin
Z—Relief Valve

Aa—Drive Valve
Ab—Nested Springs (3 used)

LVAL12121 —UN—29OCT10

36. Install shift and clutch arms and secure with spring pins.

Installation:

Installation of PRT valve block is done in reverse order of removal.

1. Tighten cap screws securing valve to transmission housing to specification.

Specification

Transmission Housing	
Cap Screw—Torque.....	24.4 N·m (18 lb-ft)

2. Tighten neutral switch to specification.

Specification

Neutral Switch—Torque.....	27 N·m (20 lb-ft)
----------------------------	-------------------

3. Tighten hydraulic line nuts to valve block to specification.

Specification

Hydraulic Line	
Nuts—Torque.....	50 N·m (37 lb-ft)

SW03989,0000E34 -19-14FEB11-15/15

PRT Machine Splitting (Rear)

Special or Required Tools:

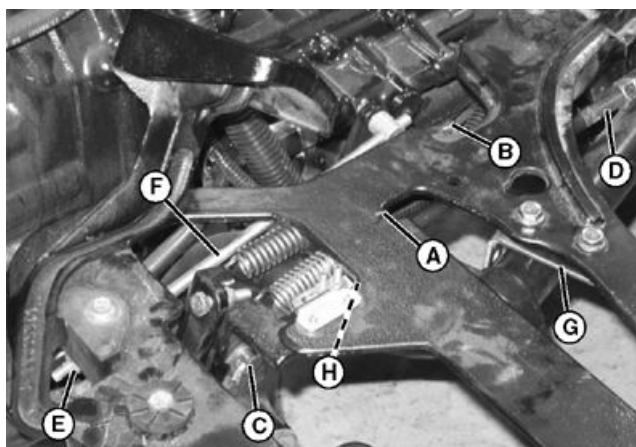
- JTO7335 Splitting Stands

Prepare the Machine:

1. Park machine on a level surface. Block wheels to keep machine stationary.
2. Disconnect battery negative cable from battery.
3. Remove hood. (See [Hood Removal and Installation](#) in Section 120, Group 10.)
4. Remove steering wheel. (See [Steering Wheel Removal and Installation](#) in Section 100, Group 30.)
5. Remove control panel. (See [Control Panel Removal and Installation](#) in Section 120, Group 10.)
6. Remove fuse panel cover. (See [Fuse Panel Cover Removal and Installation](#) in Section 120, Group 10.)
7. Remove left and right cowl panels and key switch. (See [Cowl Panel Removal and Installation](#) in Section 120, Group 10.)
8. Remove floor mat.
9. Remove seat and seat support. (See [Seat and Seat Support Removal and Installation](#) in Section 120, Group 10.)
10. Remove seat closeout. (See [Seat Closeout Removal and Installation](#) in Section 120, Group 10.)
11. Remove rear wheels and tires. (See [Rear Wheel Removal and Installation](#) in Section 120, Group 10.)
12. Remove rear fenders. (See [Rear Fenders Removal and Installation](#) in Section 120, Group 10.)
13. Remove operator platform. (See [Operator Platform Removal and Installation](#) in Section 120, Group 10.)

⚠ CAUTION: Avoid Injury! Springs are installed under tension. Use caution when attaching or disconnecting springs. Wear eye protection.

14. Remove the left brake return spring (A) and the clutch pedal spring (B).



Left Brake Return Spring

- | | |
|----------------------------|-------------------------------|
| A—Left Brake Return Spring | E—Pedal End |
| B—Clutch Pedal Spring | F—Clutch Link |
| C—Cotter Pin And Washer | G—Support Bracket |
| D—Brake Link | H—Brake Switch Wiring Harness |

15. Remove the cotter pin and washer (C) from each end of the brake link (D) and remove the link.
16. Remove the cotter pin and washer from the pedal end (E) of the clutch link (F).
17. Remove the two cap screws and nuts securing support bracket (G) to foot deck support.
18. Disconnect the wiring harness from the brake switch (H).

LVAL12122 —UN—29OCT10

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SW03989,0000E35 -19-14FEB11-1/19

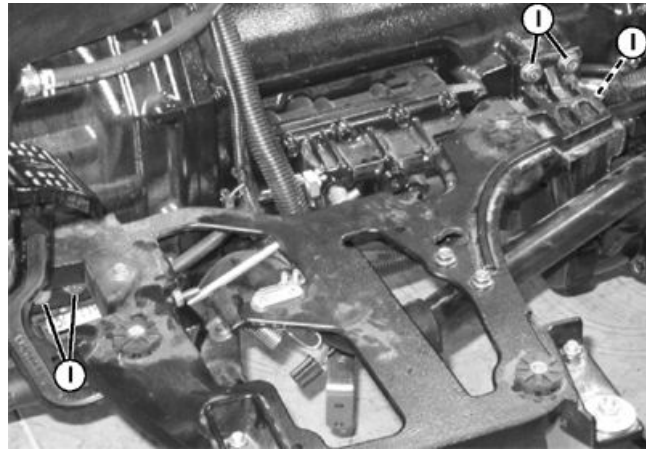
19. Remove the five cap screws (I) securing the left foot deck support and remove the support.
20. Locate and disconnect all electrical connectors attaching wiring harness to switches and lights on rear half of machine. Unfasten and wire ties and/or harness clamps and route the wiring harness forward over the top of the fuel tank.

NOTE: Hydraulic lines will have oil in them. The suction line will have approximately 0.95 L (1 qt) of oil remaining in tube. Have a suitable container ready to catch oil.

21. Drain hydraulic oil from reservoir.

Specification

Hydraulic
Reservoir—Capacity..... 23.8 liters (6.3 gal)



Left Foot Deck Support

I— Cap Screw (5 used)

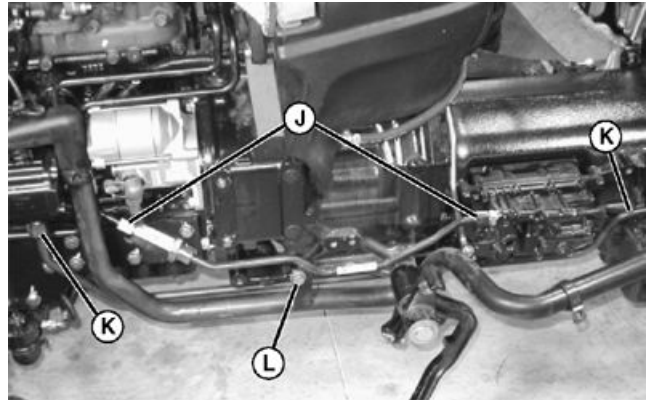
LVAL12123—UN—29OCT10

SW03989,0000E35 -19-14FEB11-2/19

22. Remove PowrReverser™ valve supply line (J).
23. Remove the hydraulic pressure line (K) from rear hydraulic pump on left side of engine and at the SCV valve.
24. Disconnect the suction line from the suction manifold at the hydraulic pump and remove the cap screw (L) securing suction line to the tunnel.

J— PowrReverser™ Valve
Supply Line
K—Hydraulic Pressure Line

L— Cap Screw



PowrReverser™ Valve Supply Line

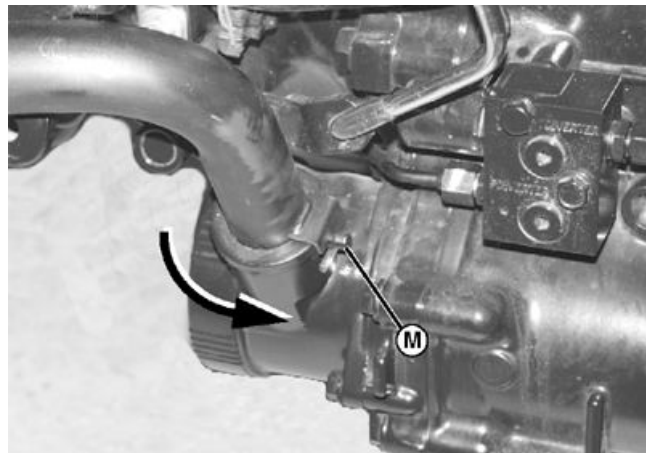
LVAL12124—UN—29OCT10

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SW03989,0000E35 -19-14FEB11-3/19

25. Turn suction tube counter clockwise until latch is clear of pin (M) and pull tube out of filter housing.

M—Pin



Suction Tube

LVAL12125—UN—29OCT10

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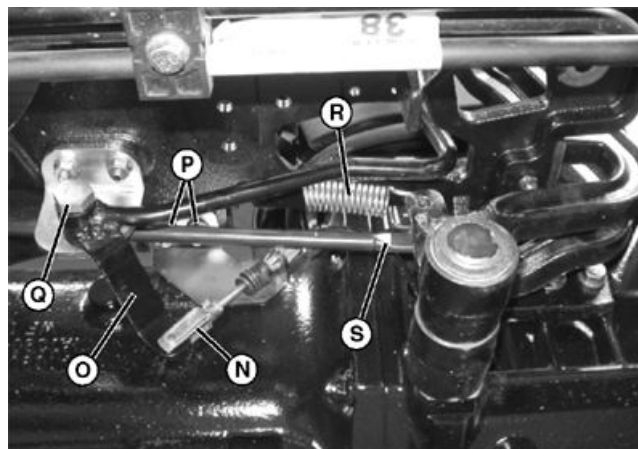
SW03989,0000E35 -19-14FEB11-4/19

26. Disconnect the throttle cable (N) from the foot pedal (O).
27. Remove the two cap screws (P) securing the throttle cable bracket to the foot deck support.
28. Remove the shoulder screw (Q) securing the foot pedal to the pivot bracket.

⚠ CAUTION: Avoid Injury! Springs are installed under tension. Use caution when attaching or disconnecting springs. Wear eye protection.

29. Remove the right brake return spring (R).
30. Remove the cotter pin and washer from each end of the brake link (S) and remove the link.

N—Throttle Cable	Q—Shoulder Screw
O—Foot Pedal	R—Right Brake Return Spring
P—Cap Screw (2 used)	S—Brake Link



Throttle Cable

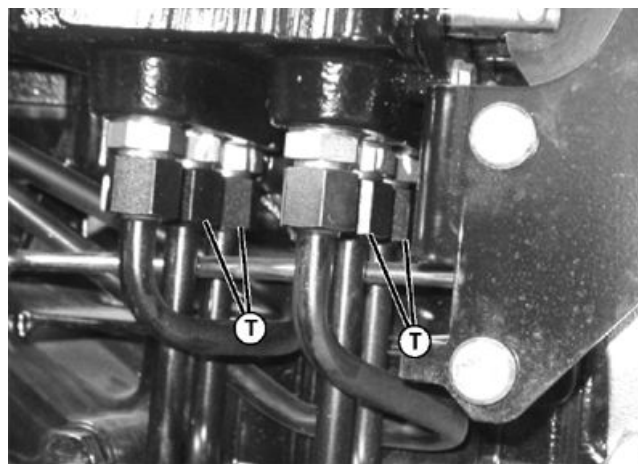
LVAL12126—UN—29OCT10

SW03989,0000E35 -19-14FEB11-5/19

NOTE: If optional third SCV is installed, six hydraulic tubes will be attached to valve. It is not necessary to disconnect these hydraulic lines.

31. Disconnect four work port tubes (T) from SCV.

T—Work Port Tube (4 used)



Work port Tubes

LVAL12127—UN—29OCT10

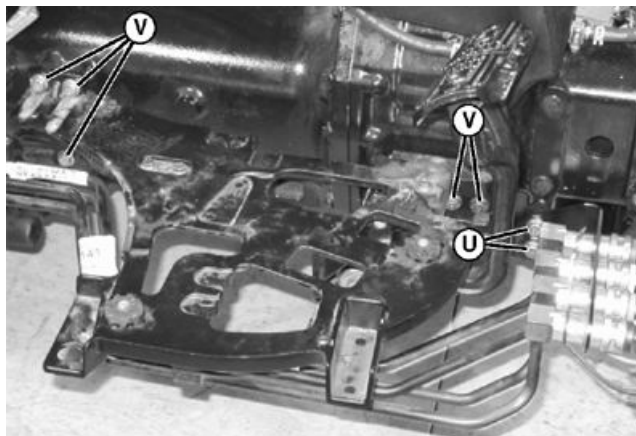
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SW03989,0000E35 -19-14FEB11-6/19

32. Remove two cap screws (U) that attach tube support bracket to frame. Remove SCV tube support bracket and SCV tubes as an assembly.
33. Remove the five cap screws (V) securing the right foot deck support and remove the support.

U—Cap Screw (2 used)

V—Cap Screw (5 used)



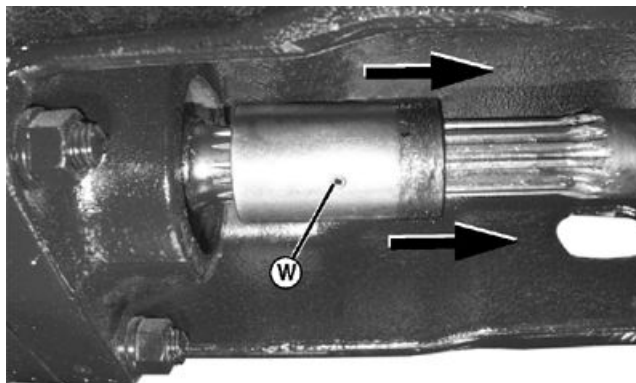
Tube Support Bracket

SW03989,0000E35 -19-14FEB11-7/19

LVAL12128 —UN—29OCT10

34. Support drive shaft. Remove MFWD drive shaft and couplers as the machine is separated. Remove split pins (W) from couplers when couplers are off for reassembly purposes.

W—Split Pin



Coupler

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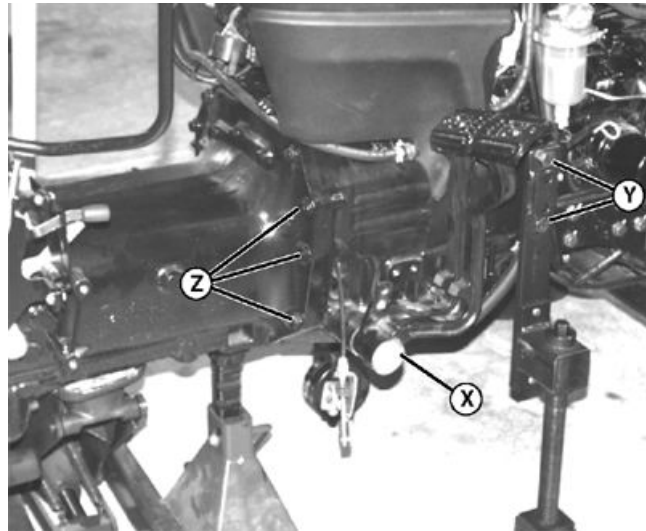
SW03989,0000E35 -19-14FEB11-8/19

LVAL12129 —UN—29OCT10

Split the Machine:

IMPORTANT: Avoid Damage! Check for, and disconnect any additional accessory wires or hydraulic tubes connecting rear half to front half before splitting machine.

1. Remove the retaining ring and washer (X). Remove the right and left brake pedals and square keys from the pivot shaft.
2. From the left side of the machine, pull the pivot shaft and clutch pedal as an assembly out of the center tunnel.
3. Using four cap screws supplied with the splitting stands, secure JTO 7335 splitting stands to the center tunnel section as shown (Y). Repeat on other side of machine.
4. Adjust splitting stands so that wheels contact the floor with light pressure, and are parallel to the machine front wheels.
5. Using suitable jack and stands, support the rear tunnel and differential housing.
6. Remove twelve cap screws (Z) attaching tunnel section to engine section of machine.
7. If necessary, use a pry bar to separate the two machine halves. Split the machine by rolling the front



Right Side Shown

X—Retaining Ring and Washer Z—Cap Screw (12 used)
Y—JTO 7335 Splitting Stands
to Center Tunnel Section

section of the machine away from the rear tunnel and differential housing.

SW03989,0000E35 -19-14FEB11-9/19

LVAL12130 —UN—29OCT10

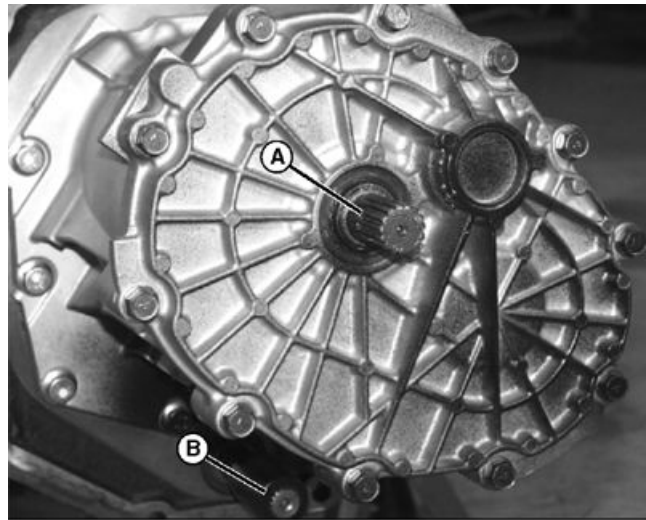
Connect the Machine:

NOTE: Splines on all drive shafts and couplers must be aligned before machine sections are bolted together.

1. Align splines on drive shaft (A), engine flywheel, and MFWD shaft (B) and coupler.

A—Splines on Drive Shaft

B—MFWD Shaft



Splines on Drive Shaft

Continued on next page

SW03989,0000E35 -19-14FEB11-10/19

LVAL12131 —UN—29OCT10

2. Move machine sections together and retain with twelve cap screws (C). Tighten cap screws to specification.

Specification

Machine Sections

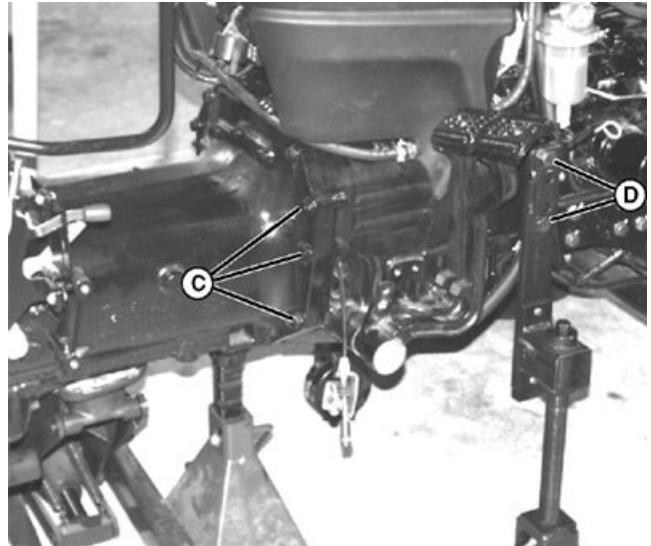
Retaining Cap

Screw—Torque..... 126—154 N·m (95—115 lb-ft)

3. Install MFWD shaft and couplers.
4. Remove cap screws (D) retaining splitting stands to machine section. Remove splitting stands.

C—Cap Screw (12 used)

D—Cap Screw (4 used)



Right Side Shown

SW03989,0000E35 -19-14FEB11-11/19

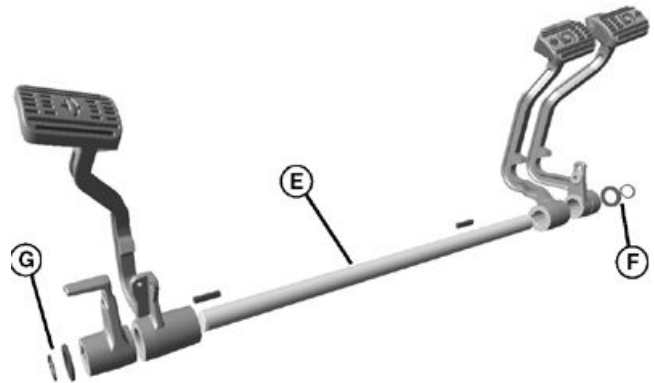
LVAL12132—UN—29OCT10

5. Install the pivot shaft (E) into the center tunnel.
6. Install the left and right brake pedals and square key onto the pivot shaft and retain with the washer and retaining ring (F).
7. Install the clutch and left brake actuator and square key onto the pivot shaft and retain with the washer and retaining ring (G).

E—Pivot Shaft

G—Washer and Retaining Ring

F—Washer and Retaining Ring



Pivot Shaft

SW03989,0000E35 -19-14FEB11-12/19

LVAL12133—UN—29OCT10

Assemble Machine Sections:

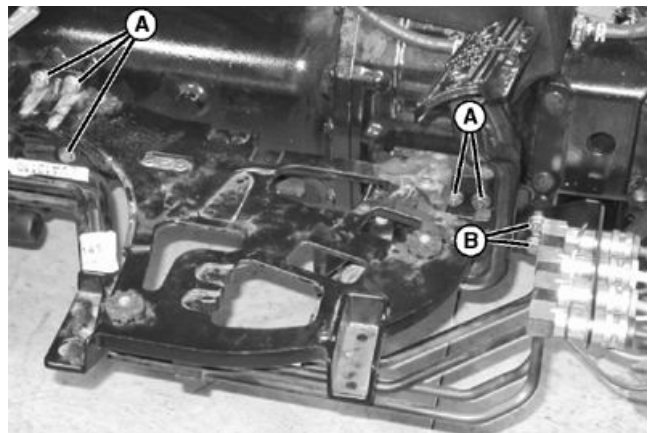
1. Install the right foot deck support and secure with five cap screws (A).

NOTE: If optional third SCV is installed, six hydraulic tubes will be attached to valve. It is not necessary to disconnect these hydraulic lines.

2. Install the SCV tube support bracket and SCV tubes as an assembly. Install two cap screws (B) to secure the tube support bracket to frame.

A—Cap Screw (5 used)

B—Cap Screw (2 used)



Right Foot Deck Support

Continued on next page

SW03989,0000E35 -19-14FEB11-13/19

LVAL12134—UN—29OCT10

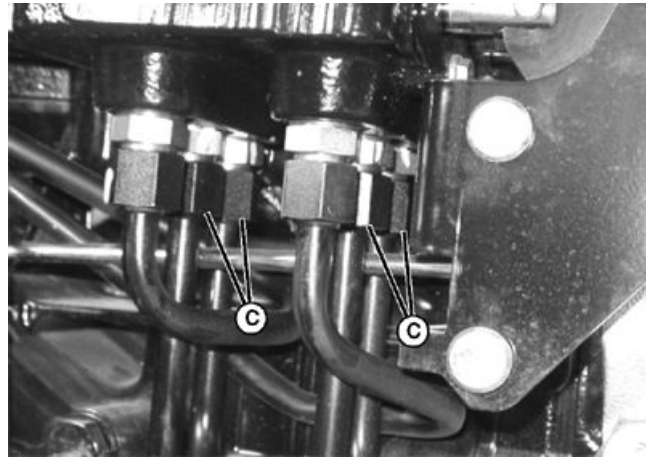
3. Connect four work port tubes (C) to SCV. Tighten to specification.

Specification

Work Port

Tubes—Torque..... 40—57 N·m (30—43 lb-ft)

C—Work Port Tube (4 used)



Work Port Tubes

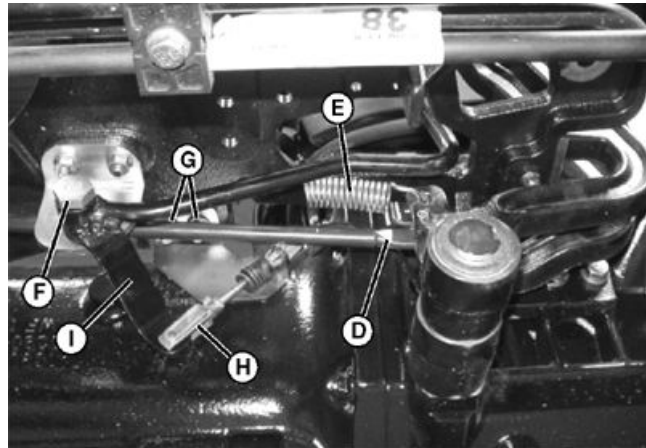
LVAL12135—UN—29OCT10

SW03989,0000E35 -19-14FEB11-14/19

4. Install the brake link (D) and retain on each end with washer and cotter pin.

⚠ CAUTION: Avoid Injury! Springs are installed under tension. Use caution when attaching or disconnecting springs. Wear eye protection.

5. Install the right brake return spring (E).
6. Install the foot pedal to the pivot bracket with shoulder screw (F) and tighten.
7. Install the throttle cable bracket to the foot deck support with two cap screws (G) and tighten.
8. Connect the throttle cable (H) to the foot pedal (I).



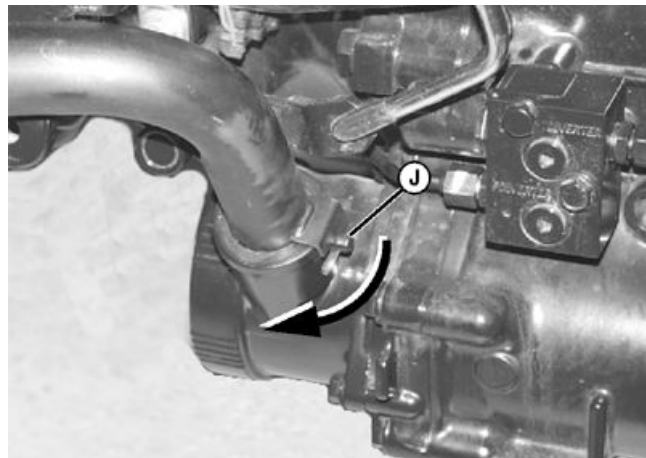
Brake Link

LVAL12136—UN—29OCT10

SW03989,0000E35 -19-14FEB11-15/19

9. Position the O-ring over the suction tube and press the tube into the filter housing. Rotate the suction tube as an assembly clockwise until latch is engaged over pin (J).

J—Pin



Suction Tube

LVAL12137—UN—29OCT10

Continued on next page

SW03989,0000E35 -19-14FEB11-16/19

10. Install the hydraulic pressure line (K) onto the rear hydraulic pump on left side of engine and to the SCV valve. Tighten to specification.

Specification

Hydraulic Pressure
Line—Torque..... 40—57 N·m (30—43 lb-ft)

11. Install the PowrReverser™ valve supply line (L) and tighten to specification.

Specification

PowrReverser™ Valve
Supply Line—Torque..... 40—57 N·m (30—43 lb-ft)

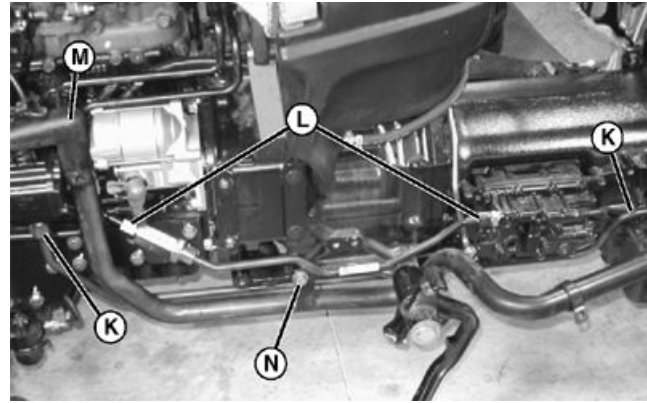
12. Connect the suction line to the suction manifold (M) at the hydraulic pump and install the cap screw (N) securing suction line to the tunnel.

13. Route the wiring harness to the rear half of the machine along the left side of the tunnel.

NOTE: If the clutch link has been removed from the PowrReverser™ valve, it needs to be installed to the valve lever before the foot deck support is installed.

14. Locate and connect all electrical connectors attaching wiring harness to switches and lights on rear half of

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Rear Hydraulic Pump

K—Hydraulic Pressure Line
L—PowrReverser™ Valve
Supply Line

M—Suction Manifold
N—Cap Screw

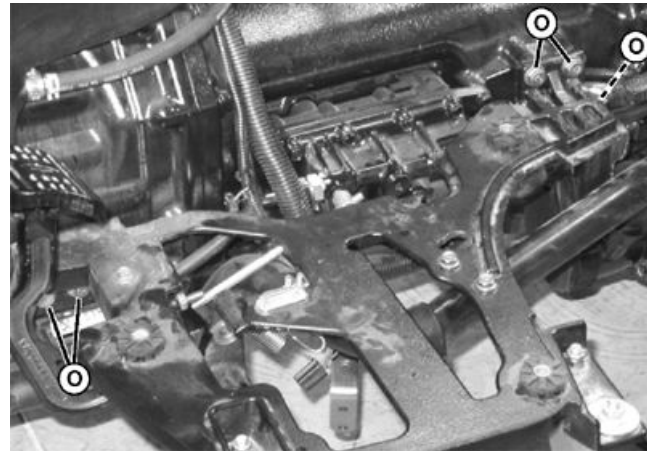
machine. Secure the wiring harness in position using wire ties as needed.

LVAL12138 —UN—29OCT10

SW03989,0000E35 -19-14FEB11-17/19

15. Install the left foot deck support and secure with five cap screws (O).

O—Cap Screw (5 used)



Left Foot Deck Support

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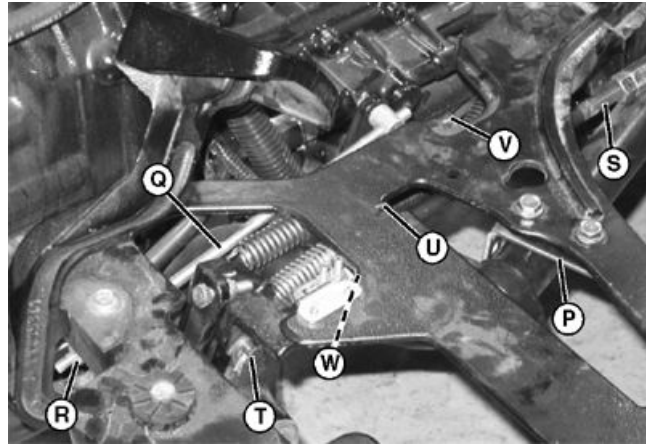
SW03989,0000E35 -19-14FEB11-18/19

LVAL12139 —UN—29OCT10

16. Install the suction tube support bracket (P) and install and tighten the two cap screws and nuts.
17. Install the clutch link (Q) to the clutch pedal and secure with a washer and cotter pin (R).
18. Install the brake link (S) and retain on each end with washer and cotter pin (T).

⚠ CAUTION: Avoid Injury! Springs are installed under tension. Use caution when attaching or disconnecting springs. Wear eye protection.

19. Install the left brake return spring (U) and the clutch pedal spring (V).
20. Connect the wiring harness to the brake switch (W).
21. Install operator platform. (See [Operator Platform Removal and Installation](#) in Section 120, Group 10.)
22. Install rear fenders. (See [Rear Fenders Removal and Installation](#) in Section 120, Group 10.)
23. Install rear wheels and tires. (See [Rear Wheel Removal and Installation](#) in Section 120, Group 10.)
24. Install seat closeout. (See [Seat Closeout Removal and Installation](#) in Section 120, Group 10.)
25. Install seat and seat support. (See [Seat and Seat Support Removal and Installation](#) in Section 120, Group 10.)
26. Install floor mat.
27. Install left and right cowl panels and key switch. (See [Cowl Panel Removal and Installation](#) in Section 120, Group 10.)
28. Install fuse panel cover. (See [Fuse Panel Cover Removal and Installation](#) in Section 120, Group 10.)



Suction Tube Support Bracket

- | | |
|--------------------------------|----------------------------|
| P—Suction Tube Support Bracket | T—Washer and Cotter Pin |
| Q—Clutch Link | U—Left Brake Return Spring |
| R—Washer and Cotter Pin | V—Clutch Pedal Spring |
| S—Brake Link | W—Brake Switch |

29. Install control panel. (See [Control Panel Removal and Installation](#) in Section 120, Group 10.)
30. Install steering wheel. (See [Steering Wheel Removal and Installation](#) in Section 100, Group 30.)
31. Install hood. (See [Hood Removal and Installation](#) in Section 120, Group 10.)
32. Fill transmission with oil.

Specification

Hydraulic
Reservoir—Capacity..... 23.8 liters (6.3 gal)

33. Connect battery negative terminal.

LVAL12140—UN—29OCT10

SW03989,0000E35 -19-14FEB11-19/19

PRT Traction Clutch Removal and Installation

Removal:

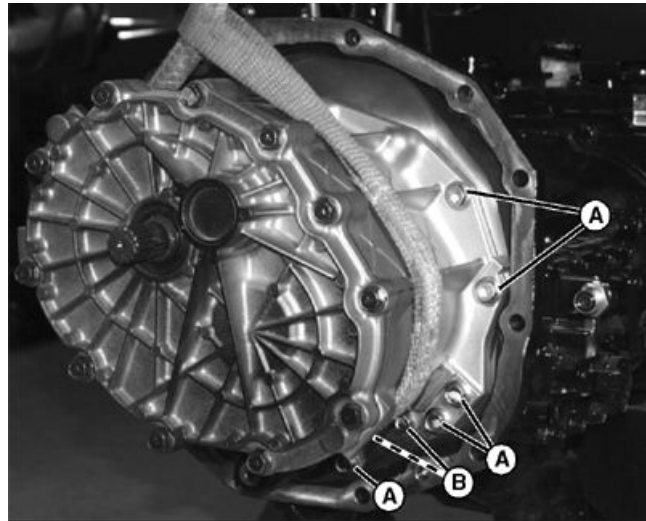
1. Split the machine. (See PRT Machine Splitting (Rear) in Section 60, Group 35.)
2. Safely support the traction clutch with a jack or hoist.

NOTE: Do not remove two caps screws (B).

3. Remove thirteen cap screws (A) securing traction clutch to transmission case (includes three cap screws through reverse case). Do not remove the two cap screws (B) securing the valve body to the traction clutch case.

NOTE: When the traction clutch is removed, the forward and reverse transfer shafts and couplers may pull out from transmission case and drop. Support the transfer shafts with one hand and pull traction clutch away from the transmission case.

4. Remove the traction clutch by pulling straight forward.



Traction Clutch To Transmission Case

A—Cap Screw (13 used)

B—Cap Screw (2 used)

LVAL12141—UN—29OCT10

SW03989,0000E36 -19-11FEB11-1/2

Installation:

1. Installation is the reverse of removal.
2. Verify that the forward (C) and reverse (D) shafts and couplers are in position and fully seated.
3. Verify that the oil tubes (E) are in position and fully seated.

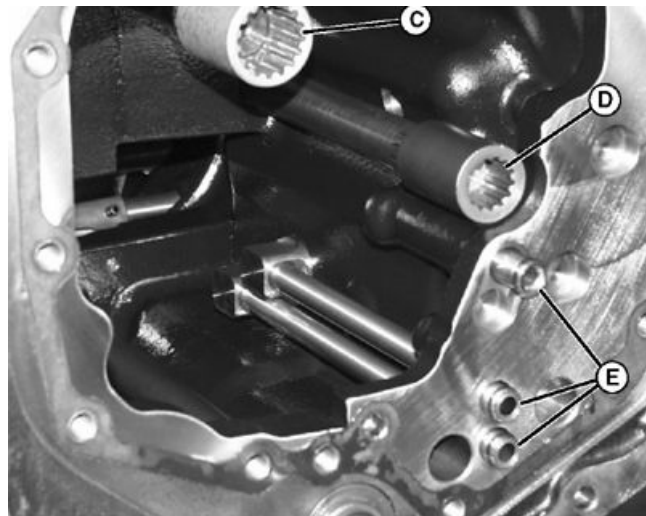
Specification

Traction Clutch Mounting

Cap Screw—Torque..... 43 N·m (32 lb-ft)

C—Forward Shaft
D—Reverse Shaft

E—Oil Tubes



Shafts and Couplers

LVAL12142—UN—29OCT10

SW03989,0000E36 -19-11FEB11-2/2

PRT Traction Clutch Disassembly and Assembly

Traction Clutch Idler Gear Removal:

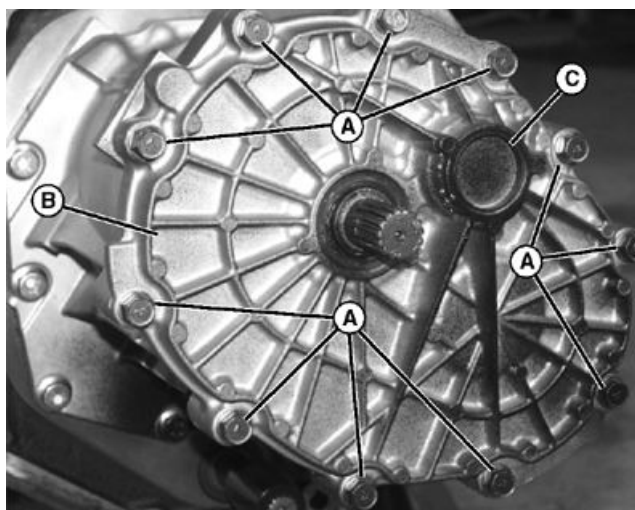
1. Remove the eleven cap screws (A) and the front cover (B) and gasket. Remove the front cover.

IMPORTANT: Avoid Damage! The seal plug will be damaged during removal. If the reverse idler gear is not damaged and spins smoothly, do not remove.

2. Remove idler gear seal plug (C) from front of front cover.

A—Cap Screw (11 used)
B—Front Cover

C—Idler Gear Seal Plug



Front Cover

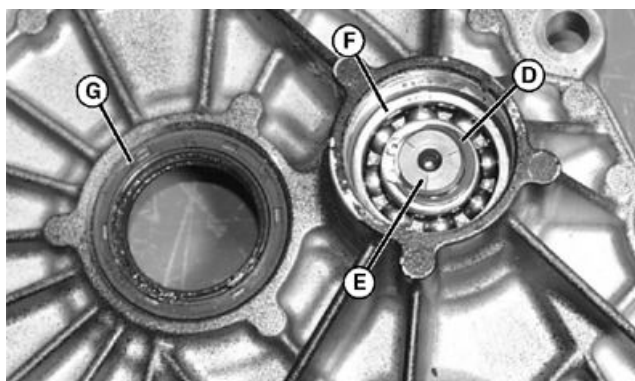
SW03989,0000E37 -19-10NOV10-1/11

LVAL12143 —UN—29OCT10

3. Remove the retaining ring (D) and washer.
4. Using a press, press the idler gear (E) out of the outer bearing (F).
5. Remove the outer bearing (F) from front cover. Use a press or puller if needed.
6. Remove bearing from idler gear shaft. Using a knife edge bearing puller if needed.

IMPORTANT: Avoid Damage! DO NOT spin bearings using compressed air. Damage to bearing balls, cage and races could result.

7. Clean bearings in suitable solvent. Dry with compressed air.
8. Inspect both bearings for discolored or burned ball and/or races. Check balls and races for spalling or cracking. Roll bearing by hand to check for rough turning or excessive looseness or play between balls and races. Replace bearings as required.
9. Inspect idler gear-22T for damage. Replace as required.



Removing Bearing and Seals From Front Cover

D—Retaining Ring
E—Idler Gear

F—Outer Bearing
G—Seal

10. Inspect idler gear shaft bearing surfaces. If damaged, replace idler gear.
11. Install in reverse order of removal. Install a new shaft seal (G) and seal plug (C, if removed) during assembly.

Continued on next page

SW03989,0000E37 -19-10NOV10-2/11

LVAL12144 —UN—29OCT10

Traction Clutch Disassembly:

1. Remove the traction drive shaft and clutch as an assembly, to a clean work area.



Traction Drive Shaft

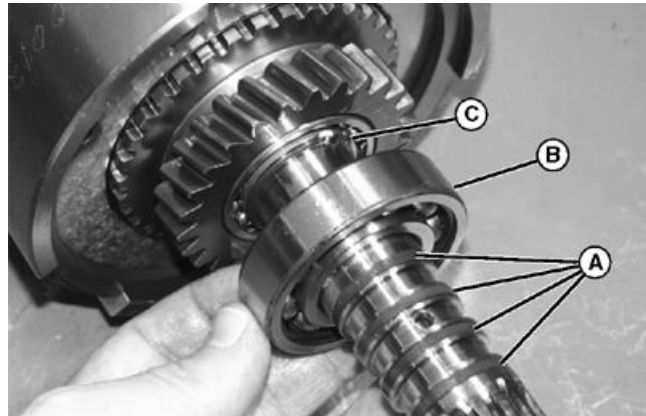
LVAL12145—UN—29OCT10

SW03989,0000E37 -19-10NOV10-3/11

2. Remove four split ring seals (A) from shaft.
3. Remove bearing (B) from shaft. Use a knife edge bearing puller if needed.
4. Remove snap ring (C) from shaft.

A—Split Ring Seal (4 used)
B—Bearing

C—Snap Ring



Split Ring Seals

LVAL12146—UN—29OCT10

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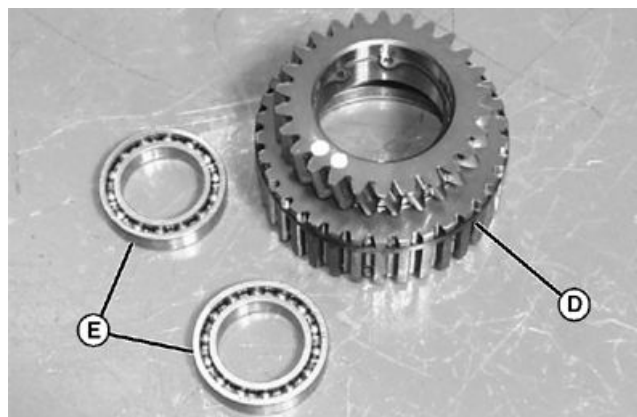
SW03989,0000E37 -19-10NOV10-4/11

NOTE: Mark the clutch gear before removal for installation to the correct end of the clutch pack and clutch drive shaft.

5. Remove the clutch gear-26T (D) and bearings (E) from the shaft.
6. Remove the clutch gear-25T and bearings from the opposite end of the shaft.

IMPORTANT: Avoid Damage! DO NOT spin bearings using compressed air. Damage to bearing balls, cage and races could result.

7. Clean bearings in suitable solvent. Dry with compressed air.
8. Inspect both bearings for discolored or burned ball and/or races. Check balls and races for spalling or cracking. Roll bearing by hand to check for rough turning or excessive looseness or play between balls and races. Replace bearings as required.



Clutch Gear-26T

D—Clutch Gear-26T

E—Bearing (2 used)

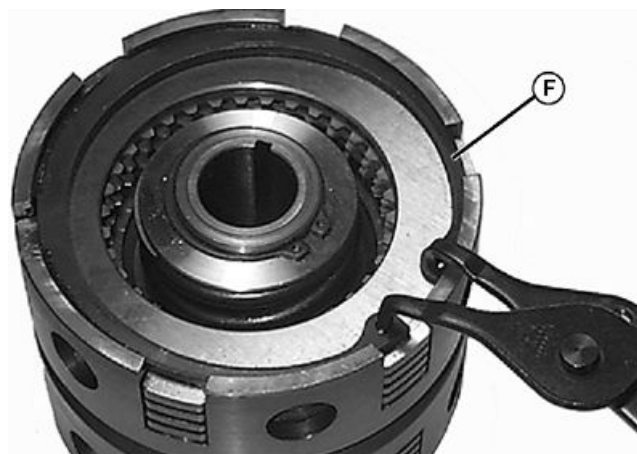
9. Slide clutch assembly off shaft.

SW03989,0000E37 -19-10NOV10-5/11

LVAL12147 —UN—29OCT10

10. Remove snap ring (F) and clutch plate pack.
11. Perform previous step for other side of clutch assembly.

F—Snap Ring



Clutch Plate Pack

Continued on next page

SW03989,0000E37 -19-10NOV10-6/11

LVAL12148 —UN—29OCT10

12. Inspect end plate (G), separator plates (H) and friction plates (I) for wear, discoloration, scoring or warping. Measure plate thickness. If plate(s) do not meet minimum plate thickness specification, replace clutch plate pack as a unit.

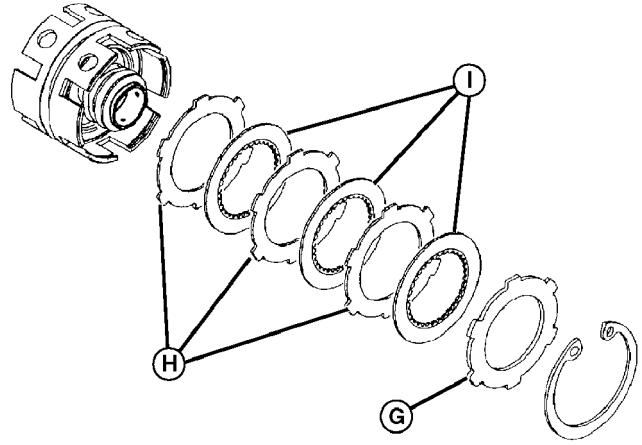
Specification

End Plate—Minimum Thickness.....	4.85 mm (0.191 in.)
Separator Plate(s)—Minimum Thickness.....	2.85 mm (0.112 in.)
Friction Plate(s)—Minimum Thickness.....	2.7 mm (0.106 in.)

G—End Plate

H—Separator Plate (3 Used)

I—Friction Plate (3 Used)



Clutch Assembly

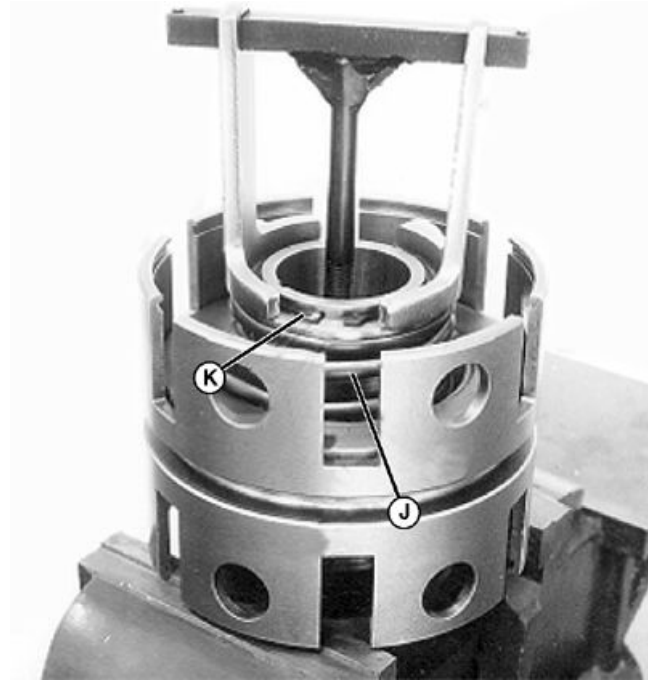
SW03989,0000E37 -19-10NOV10-7/11

LVAL12149 —UN—12NOV10

13. Place clutch body and special tool JDT24B Spring Washer Compressor on a press or flat jawed vise.
14. Compress spring (J) and retaining ring (K).
15. Remove snap ring and slowly release tension on spring.
16. Remove snap ring, spring retention plate and spring.

J—Spring

K—Retaining Ring



Spring Washer Compressor

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SW03989,0000E37 -19-10NOV10-8/11

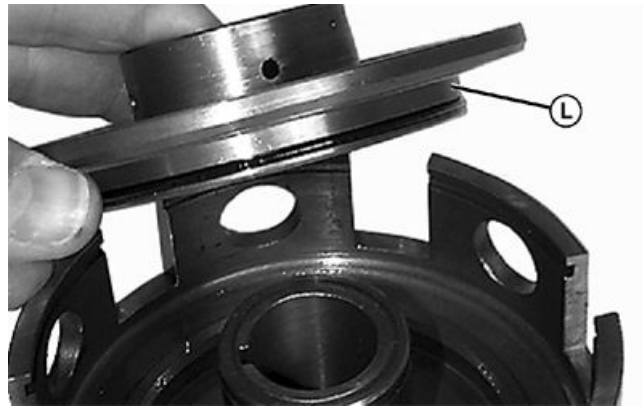
LVAL12150 —UN—29OCT10

17. Remove clutch piston (L).
18. Perform steps 13 through 17 for opposite side.
19. Measure length (no load) of each spring. If spring length is less than specification, replace spring.

Specification

Spring—Length
(minimum)..... 45.5 mm (1.79 in.)

20. Clean clutch body in solvent and dry with compressed air.
21. Clean and inspect pistons for wear, corrosion or pitting. Replace as necessary.
22. Replace packing on outside of each piston.
23. Lubricate all parts with clean, fresh hydraulic oil and reassemble.



Clutch Piston

L—Clutch Piston

LVAL12151—UN—29OCT10

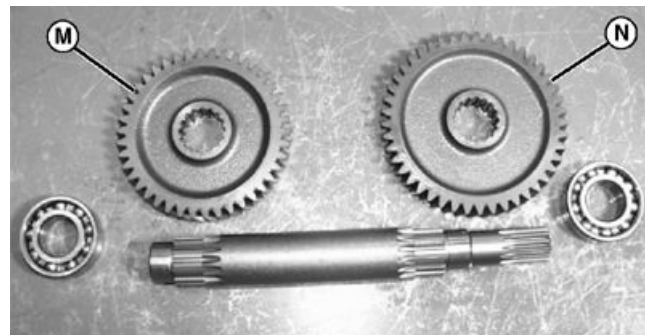
SW03989,0000E37 -19-10NOV10-9/11

Transfer Shaft Disassembly:

1. Remove reverse transfer shaft assembly from transmission case with traction clutch assembly.
2. Using a knife edge bearing puller, remove bearings, gear-42T (M) and gear-45T (N) from shaft.

IMPORTANT: Avoid Damage! DO NOT spin bearings using compressed air. Damage to bearing balls, cage and races could result.

3. Clean bearings in suitable solvent. Dry with compressed air.
4. Inspect both bearings for discolored or burned ball and/or races. Check balls and races for spalling or cracking. Roll bearing by hand to check for rough turning or excessive looseness or play between balls and races. Replace bearings as required.
5. Inspect gear teeth for damage. Replace as required.



Gears

M—Gear-42T

N—Gear-45T

6. Inspect transfer shaft bearing surfaces. Replace if surfaces are damaged.

LVAL12152—UN—29OCT10

Continued on next page

SW03989,0000E37 -19-10NOV10-10/11

7. Remove the thirteen cap screws (O), and remove the manifold (P), porting plate (Q), and porting/bearing plate (R, inside).
8. Mark and remove the three plug and O-rings (S).
9. Remove any gasket material from components.
10. Clean the ports and channels in all components in suitable solvent. Dry with compressed air.
11. Inspect drive shaft bore in the manifold for wear or scoring.
12. Assembly is in reverse order of disassembly.
13. Install new gaskets.
14. Install manifold, porting plate, and porting/bearing plate (inside) and cap screws. Tighten cap screws to specification.

Specification

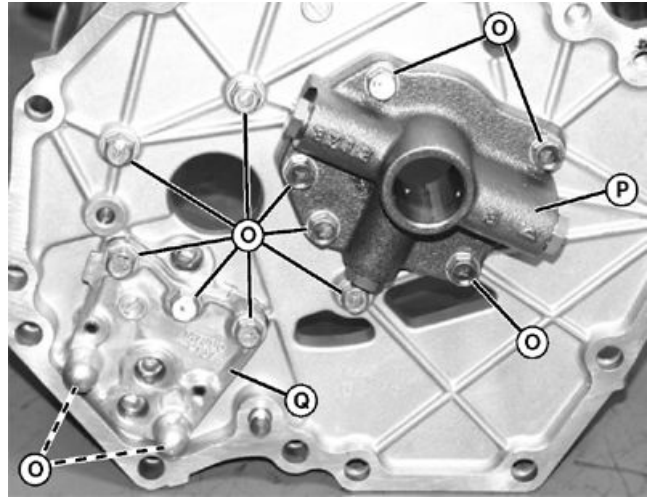
Cap Screw—Torque..... 19–23 N·m (14–17 lb-ft)

Installation:

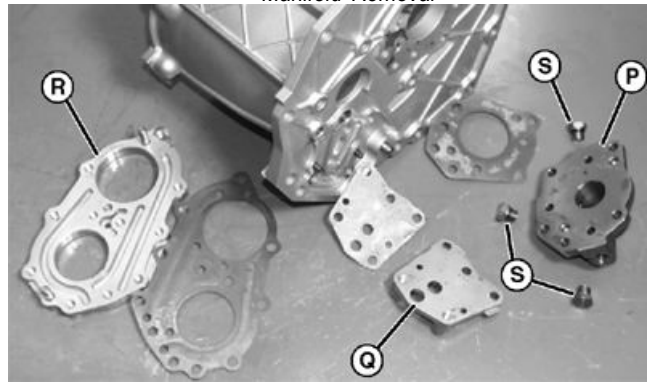
1. Remove any old gasket material from clutch front cover and clutch housing.
2. Place transfer shaft assembly (smaller gear-42T toward front cover) next to clutch, engage gears, and slide clutch assembly and transfer shaft assembly into clutch housing. Ensure transfer shaft and clutch shaft bearing are seated in bearing pocket and gear teeth are engaged.
3. Install front cover and reverse idler gear assembly to clutch housing. Ensure transfer shaft and clutch shaft bearing are seated in bearing pocket and gear teeth are engaged. Install cap screws and tighten to specification.

Specification

Cap Screw—Torque..... 19–23 N·m (14–17 lb-ft)



Manifold Removal



Gasket Removal

O—Cap Screw (13 Used)
P—Manifold
Q—Porting Plate

R—Porting/Bearing Plate
S—O-rings (3 Used)

LVAL12153—UN—29OCT10

LVAL12154—UN—29OCT10

SW03989,0000E37 -19-10NOV10-11/11

Transmission Gear Set Removal and Installation

Gear Set Removal:

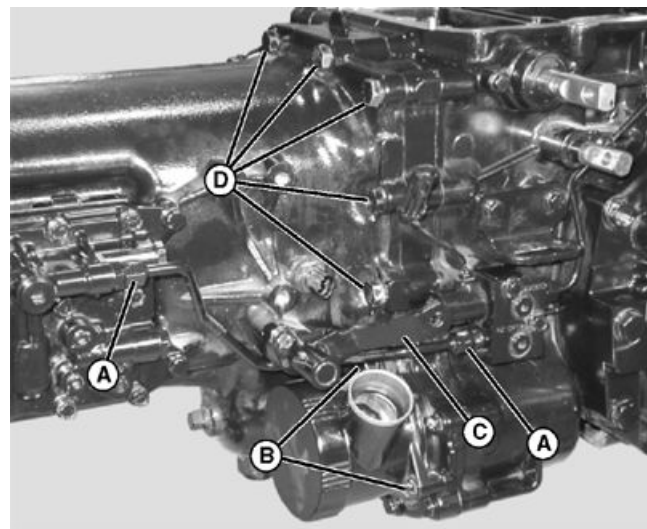
1. Split the rear half of the machine. (See PRT Machine Splitting (Rear).)
2. Remove the rockshaft. (See Rockshaft Removal and Installation.)
3. Remove the SCV. (See Selective Control Valve (SCV) (SN —710000) or Selective Control Valve (SCV) (SN 710001—).)
4. Remove the hydraulic line (A) at PTO valve.
5. Remove the three cap screws (B) and remove the hydraulic oil filter and filter case.

NOTE: The MFWD coupler detent balls and spring will fall out if the coupler stays on the drive pinion shaft during separation of the transmission case. Placing and holding the MFWD lever in the disengaged position will hold the coupler over the detent balls.

6. Push the MFWD lever (C) down to the disengaged position.

NOTE: Note the location and length of the transmission case to rear axle case cap screws.

7. Safely support the transmission case and remove the fourteen cap screws (D) (five shown) securing the transmission case to the rear axle case.



Hydraulic Line

A—Hydraulic Line
B—Cap Screw (3 used)

C—MFWD Lever
D—Cap Screw (14 used)

NOTE: The couplers for the PTO and drive shafts may stay with either the transmission case or the rear axle case. Locate the couplers, noting location and marking for assembly if needed.

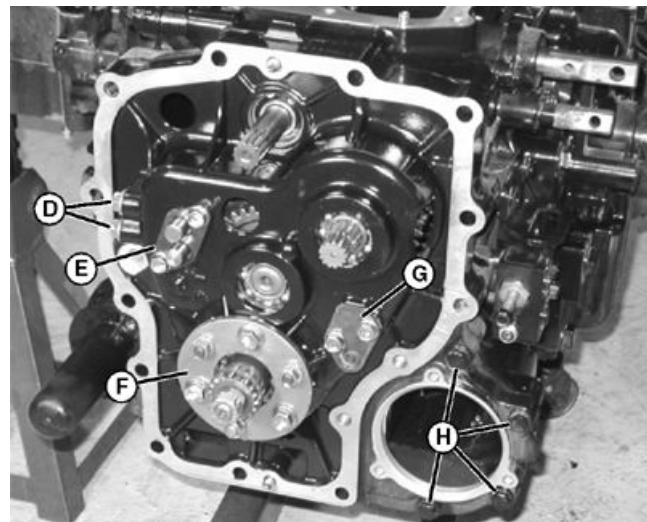
8. Split the transmission case from the rear axle case.
9. Remove the PTO and drive shaft couplers.

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10. Remove the two cap screws (D) and the detent springs and balls.
11. Remove the retainer plate (E) and detent ball.
12. Remove the three cap screws and the three nuts and lock washers, and remove the retainer plate (F).
13. Remove the retainer plate (G) and the detent spring and ball.
14. Remove four cap screws (H) securing center plate to rear axle case.
15. Remove the center plate.

D—Cap Screw (2 used)
E—Retainer Plate
F—Retainer Plate

G—Retainer Plate
H—Cap Screw (4 used)



Detent Springs

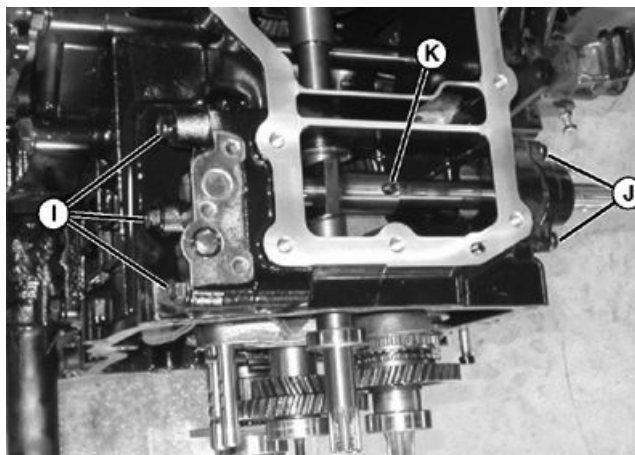
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SW03989,0000E38 -19-18DEC12-2/31

16. Remove the three cap screws (I) securing the manifold/shift holder to the axle case. Remove the manifold/shift holder.
17. Remove the two cap screws (J) securing the pivot block to the axle case. Remove the pivot block. Inspect the shaft seal and o-ring on the pivot block, replace as necessary.
18. Remove the roll pin (K) securing the shift lever to the shift shaft.

I— Cap Screw (3 used)
J— Cap Screw (2 used)

K—Roll Pin



Manifold/Shift Holder

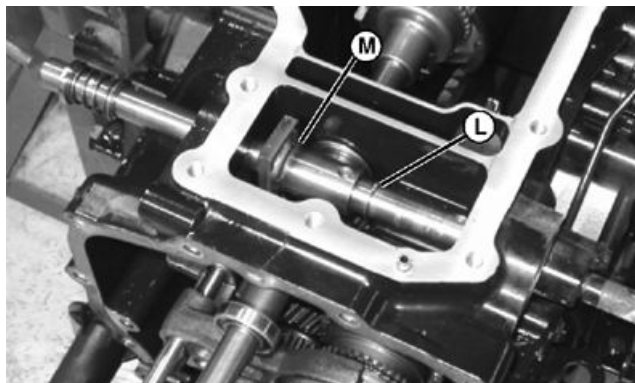
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LVAL12157 —UN—29OCT10

19. Slide the shift shaft out of the axle case to expose the retaining ring (L). Remove the retaining ring and the shift shaft.
20. Remove the shift lever (M).
21. Remove drive gear assembly to work bench.
22. Visually inspect all parts for wear, cracks or discoloration.

L—Retaining Ring

M—Shift Lever



Retaining Ring

SW03989,0000E38 -19-18DEC12-4/31

LVAL12158 —UN—29OCT10

Shift Forks and Shafts Disassembly and Inspection:

1. Separate the shift fork and gear assemblies.



Shift Fork and Gear Assembly

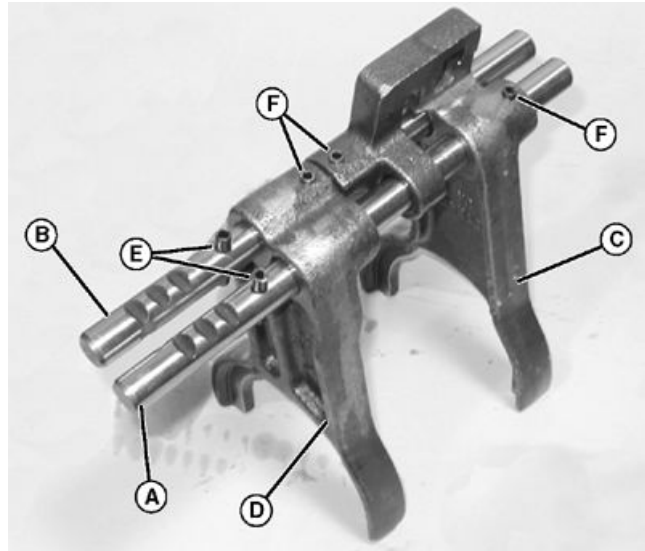
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LVAL12159 —UN—29OCT10

2. Inspect 1st and 2nd gear fork shaft (A) and 3rd and 4th gear fork shaft (B) for wear.
3. Inspect 1st and 2nd gear shift fork (C) and 3rd and 4th gear shift fork (D) for wear.
4. Inspect rolled pins (E) in fork shafts for wear and proper positioning centered through shafts.
5. If shafts of forks need to be replaced, drive out rolled pins (F) in gear fork shafts as needed.
6. Coat all parts in fresh hydraulic oil and assemble in reverse order of disassembly.

A—1st and 2nd Gear Fork Shaft



Gear Fork Shaft Inspection

SW03989,0000E38 -19-18DEC12-6/31

LVAL12160 —UN—29OCT10

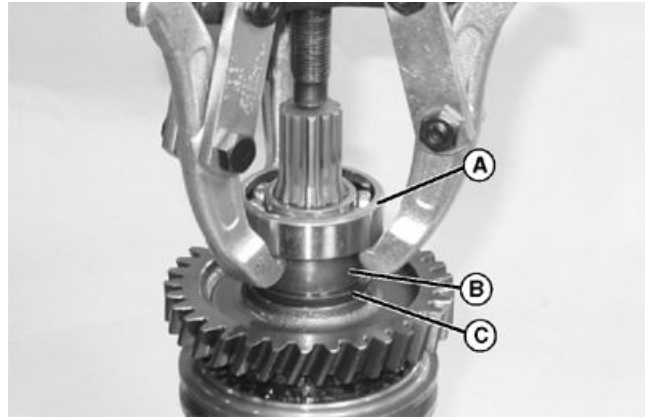
4 Speed Gear Shaft Disassembly and Inspection:

NOTE: Disassembly of gear shaft is done from each end of gear shaft. Bearings on ends of gear shaft assembly are press fit on shaft and both bearings must be removed for complete disassembly.

1. Using a bearing puller, remove end bearing (A) and wide (B) and thin (C) spacers from splined end of shaft.

A—End Bearing
B—Spacer

C—Spacer



End Bearing

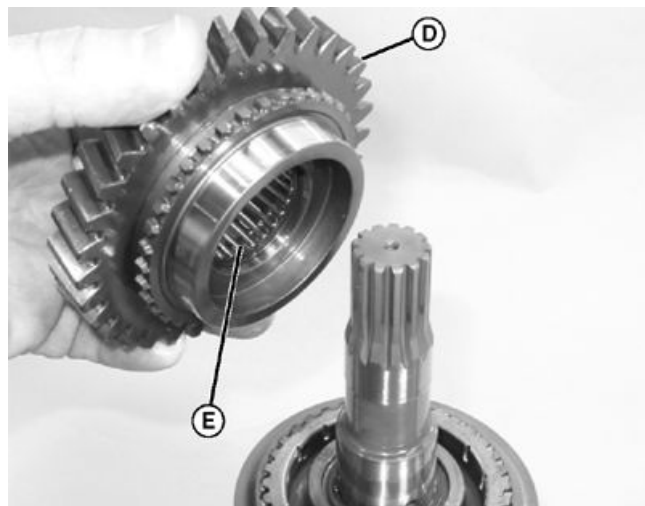
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LVAL12161 —UN—29OCT10

IMPORTANT: Avoid Damage! Some gears have right pitched teeth and others have left pitched teeth. Mark gears if needed to be sure they are assembled in the proper position.

2. Remove gear-33T-RH (D).
3. Inspect gear for broken or worn teeth. Inspect bearing surface for wear. Replace as required.
4. Inspect needle bearing (E) for wear or damage.

D—Gear-33T-RH



Gear Removal

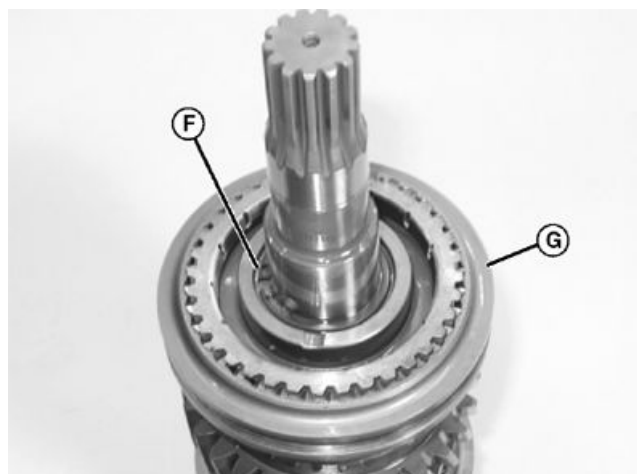
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LVAL12162 —UN—29OCT10

5. Remove snap ring (F).
6. Remove synchromesh gears and shift collar (G) as an assembly.

F—Snap ring



Snap Ring

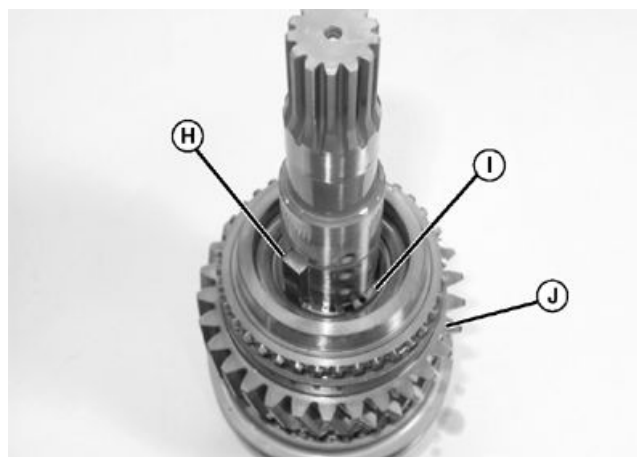
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LVAL12163—UN—29OCT10

7. Remove square key (H) and retaining ring (I).
8. Remove gear-29T-LH (J).
9. Inspect gear for broken or worn teeth. Inspect bearing surface for wear. Replace as required.

H—Square Key

I— Retaining Ring



Square Key Removal.

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LVAL12164—UN—29OCT10

10. Inspect needle bearing (K) for wear or damage.

K—Needle Bearing



Needle Bearing

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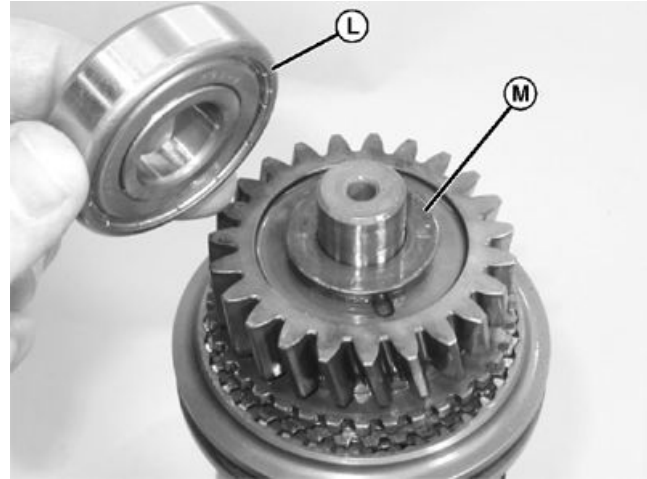
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LVAL12165—UN—29OCT10

11. Using a knife edge bearing puller, remove end bearing (L) and thrust washer (M) from other (short) end of shaft.

L—End Bearing

M—Thrust Washer



End Bearing Removal

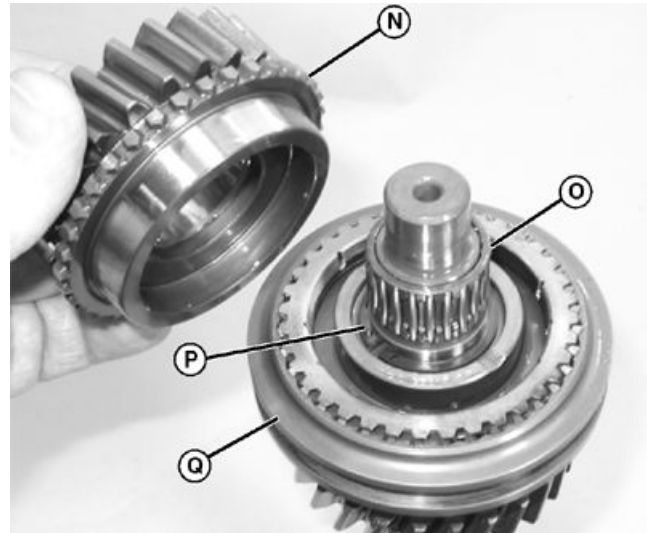
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LVAL12166 —UN—29OCT10

12. Remove gear-23T-LH (N) and needle bearing (O).
13. Inspect gear for broken or worn teeth. Inspect bearing surface for wear. Replace as required.
14. Remove snap ring (P).
15. Remove synchromesh gears and shift collar (Q) as an assembly.

N—Gear-23T-LH
O—Needle Bearing

P—Snap Ring
Q—Shift Collar



Gear Removal

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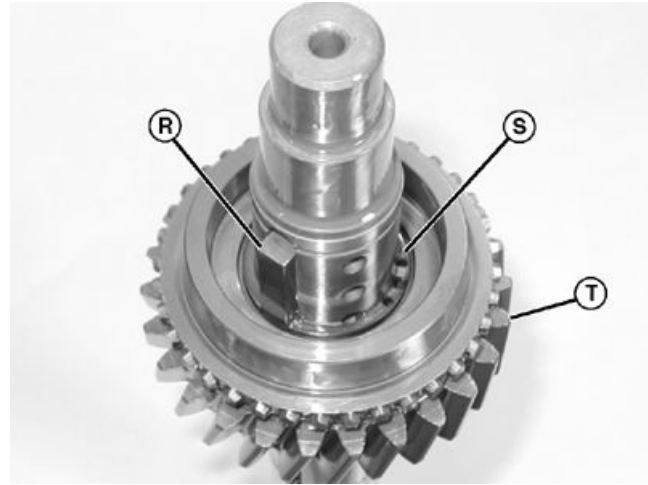
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LVAL12167 —UN—29OCT10

16. Remove square key (R) and retaining ring (S).

R—Square Key

S—Retaining Ring



Square Key Removal

SW03989,0000E38 -19-18DEC12-14/31

LVAL12168—UN—29OCT10

17. Remove gear-26T-RH (T) and needle bearing (U).

18. Inspect gear for broken or worn teeth. Inspect bearing surface for wear. Replace as required.

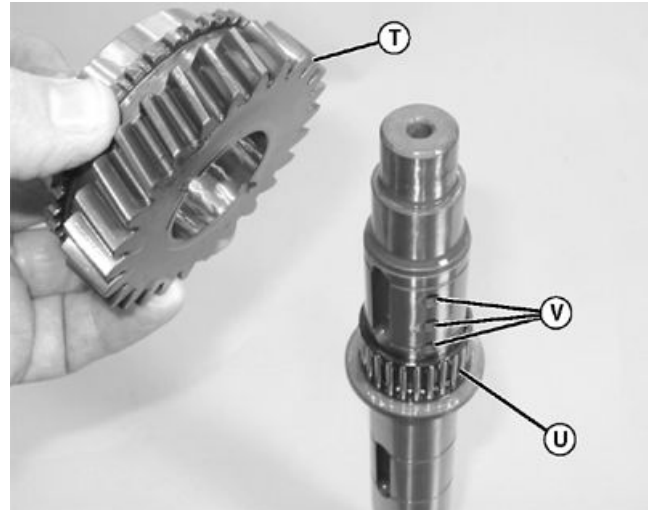
19. Inspect the shaft for ware or damage. Verify the splines are not worn. Check the lubrication oil passages (V). Replace shaft as required.

20. Coat all parts in fresh hydraulic oil and assemble in reverse order of disassembly.

T—Gear-26T-RH

U—Needle Bearing

V—Lubrication Oil Passages



Gear Removal

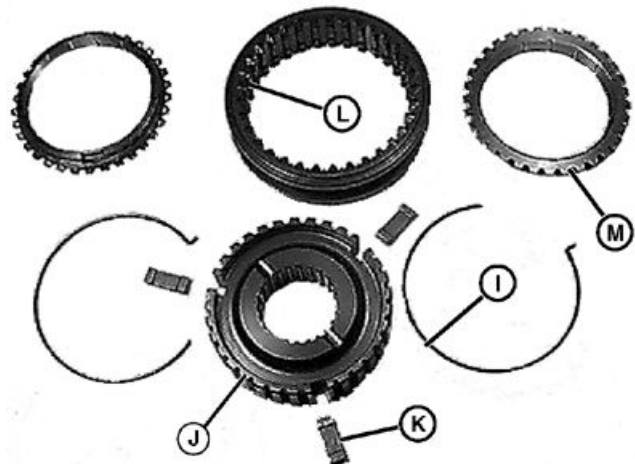
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LVAL12169—UN—29OCT10

Synchromesh Gear Disassembly, Inspection and Reassembly:

1. Disassemble synchromesh assembly by removing wire ring clips (I) from shift collar and sliding synchromesh ring (J) and ring keys (K) out of shift collar.
2. Clean gears, ring and collar in suitable solvent. Dry with compressed air.
3. Inspect ring and collar (L) for wear, cracking, broken or missing teeth, and plugged or filled oil lubrication passages. Replace as required.
4. Inspect synchromesh gears (M) for wear on tapered surfaces, plugged or filled in internal grooves, broken or missing teeth. Replace as required.



Synchromesh Assembly

I— Wire Ring Clip (2 used) K—Ring Key (3 used)
J— Sliding Synchromesh Ring

LVAL12170—UN—29OCT10

SW03989,0000E38 -19-18DEC12-16/31

5. Coat surfaces of parts with fresh hydraulic oil.
6. Insert three ring keys (K) and synchromesh ring (J) into shift collar (L).
7. Install a wire clip (I) on each side of shift collar. Ensure wire clip engages all ring keys on each side.
8. Place synchromesh gear (M) on each side of shift collar with notches aligned with ring keys.
9. Set assembly aside.
10. Repeat steps 1 through 9 for second synchromesh gear assembly.
11. Coat all parts in fresh hydraulic oil and assemble in reverse order of disassembly.



Ring Keys

Mid Shaft Disassembly, Inspect and Assembly:

IMPORTANT: Avoid Damage! DO NOT spin bearings using compressed air. Damage to bearing balls, cage and races could result.

1. Clean transmission top shaft, gears and bearings in suitable solvent. Dry with compressed air.

J— Synchromesh Ring
K—Ring Keys

L—Shift Collar

LVAL12171—UN—29OCT10

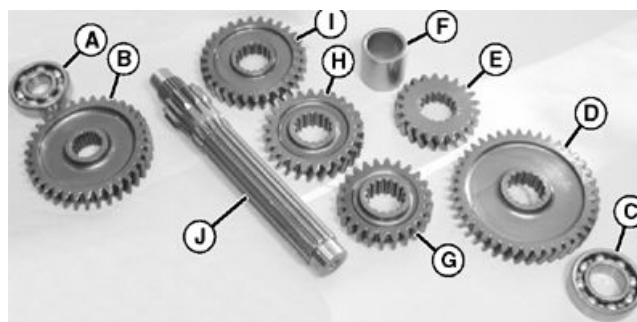
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2. Inspect both bearings for discolored or burned balls and/or races. Check balls and races for spalling or cracking. Roll bearing by hand to check for rough turning or excessive looseness or play between balls and races. Replace bearings as required.

A—Bearing
B—Gear-35T
C—Bearing
D—Gear-41T
E—Gear-22T

F—Spacer
G—Gear-24T
H—Gear-26T
I—Gear-30T
J—Mid Shaft



Bearing

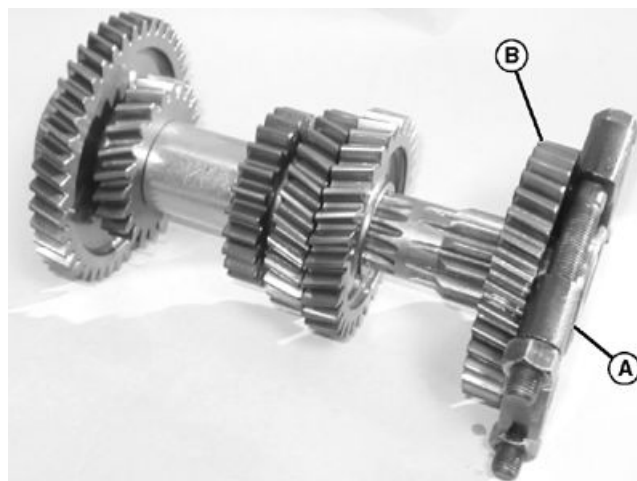
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LVAL12172 —UN—29OCT10

3. Using a knife edge bearing puller, remove end bearing (A) from shaft.
4. Remove gear-35T (B).

A—End Bearing

B—Gear-35T



End Bearing

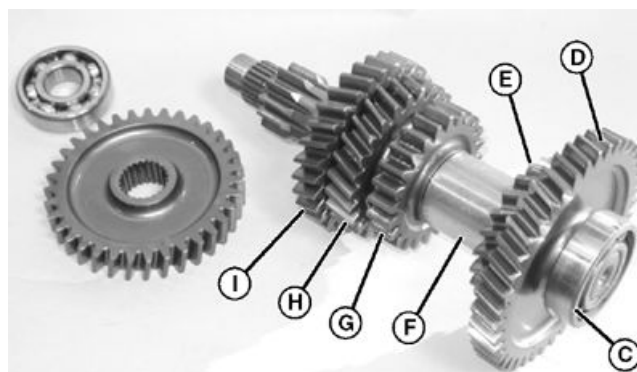
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LVAL12173 —UN—29OCT10

5. Using a knife edge bearing puller, remove end bearing (C) from shaft.
6. Remove gear-41T (D), gear-22T (E), spacer (F), gear-24T (G), gear-26T (H), gear-30T (I).
7. Inspect gear for broken or worn teeth. Inspect bearing surface for wear. Inspect the shaft for wear or damage. Verify the splines are not worn. Replace shaft as required.
8. Coat all parts in fresh hydraulic oil and assemble in reverse order of disassembly.

C—End Bearing
D—Gear-41T
E—Gear-22T
F—Spacer

G—Gear-24T
H—Gear-26T
I—Gear-30T



Bearing

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LVAL12174 —UN—29OCT10

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Drive/Pinion Shaft Disassembly, Inspect and Assembly:

1. Remove the jam nuts (A), spacer (B), and coupler gear (C). It is not necessary to remove the retaining ring (D) from the coupler gear unless, the retaining ring is damaged.
2. Using a knife edge bearing puller, remove end bearing (E) and retainer (F) from shaft.
3. Remove the spacer (G), gear-20T (H), long splined collar (I), and shift collar (J).
4. Remove the retaining rings (K), spacer (L), and gear-35T (M).

A—Jam Nut

B—Spacer

C—Coupler Gear

D—Retaining Ring

E—End Bearing

F—Retainer

G—Spacer

H—Gear-20T

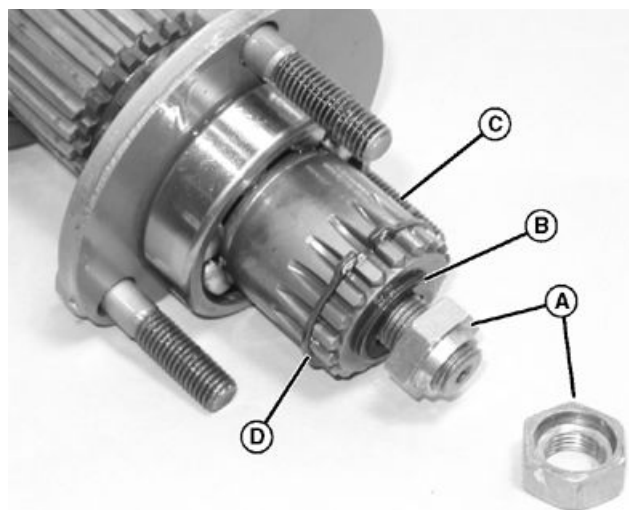
I—Long Splined Collar

J—Shift Collar

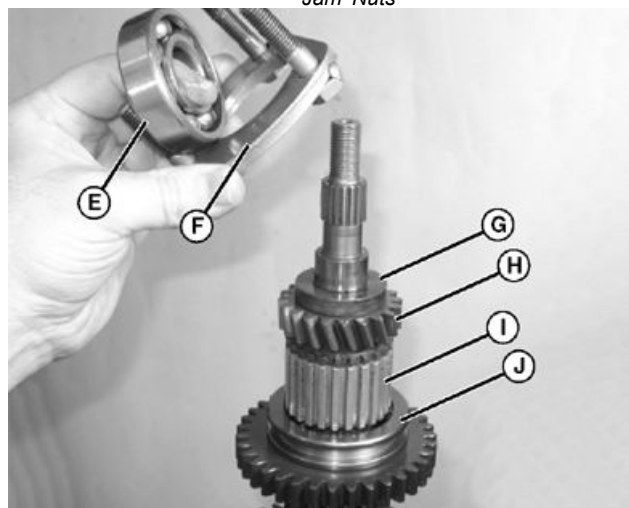
K—Retaining Ring

L—Spacer

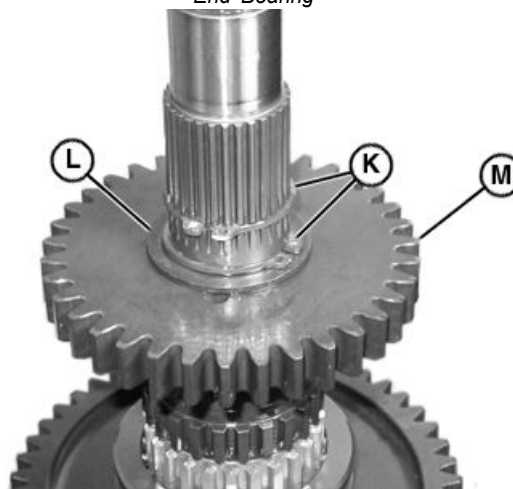
M—Gear-35T



Jam Nuts



End Bearing



Retaining Ring

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LVAL12176—UN—29OCT10

LVAL13886—UN—17DEC10

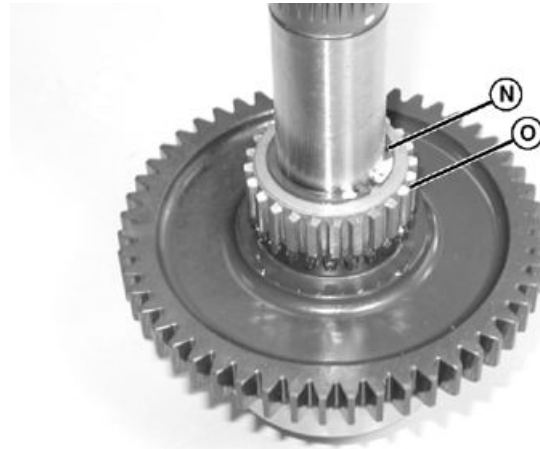
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5. Remove retaining ring (N) and short splined collar (O).

N—Retaining Ring

O—Short Splined Collar



Retaining Ring

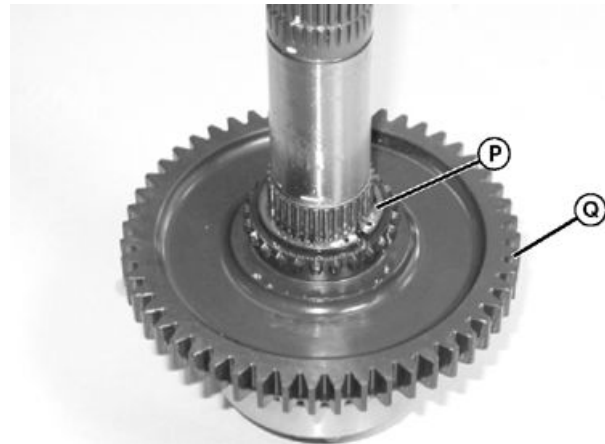
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LVAL12178 —UN—29OCT10

6. Remove retaining ring (P) and gear-51T (Q).

P—Retaining Ring

Q—Gear-51T



Retaining Ring

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LVAL12179 —UN—29OCT10

7. Press the end bearing (R) from the shaft.
8. Inspect gear for broken or worn teeth. Inspect bearing surface for wear. Inspect the shaft for ware or damage. Verify the splines are not worn. Replace shaft as required.
9. Coat all parts in fresh hydraulic oil and assemble in reverse order of disassembly. Tighten jam nuts to specification.

Specification

Jam Nut—Torque.....78.5—9.8 N·m (57.9 7.2 lb-ft)

R—End Bearing



End Bearing

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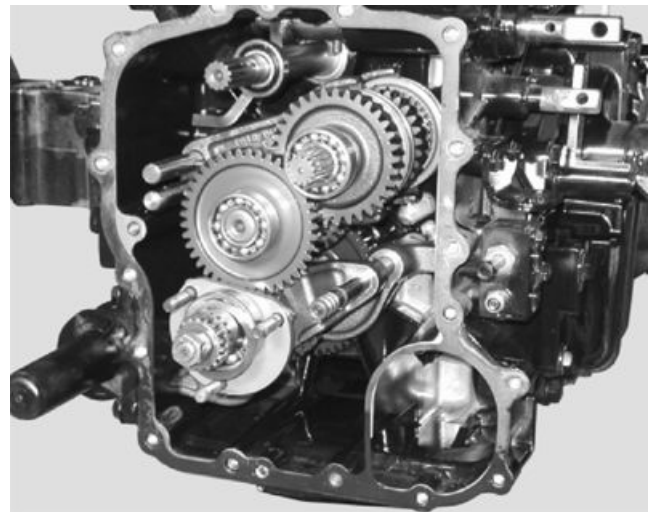
LVAL12180 —UN—29OCT10

Gear Set Installation:

1. Remove any gasket material from components.
2. Clean the ports and channels in all components in suitable solvent. Dry with compressed air.
3. Assembly is done in reverse order of disassembly. Coat all parts with clean hydraulic oil during assembly.
4. Install new gaskets.
5. Fully assemble gear shaft assemblies.

⚠ CAUTION: Avoid Injury! Machine component is heavy. Use a safe lifting device or get an assistant to help lift and hold component into place for installation.

NOTE: Gear set and shift forks must be installed as an assembly.



Gear Shaft Assembly

6. Install gear shaft assembly part way into transmission case, align shift forks with shift collars and shift levers.
7. Align shaft bearing and shift fork shafts with bearing pockets and shift fork journals, and fully seat all parts into transmission case.
8. Verify that PTO shaft bearing is fully seated in rear axle case and engaged into PTO clutch.

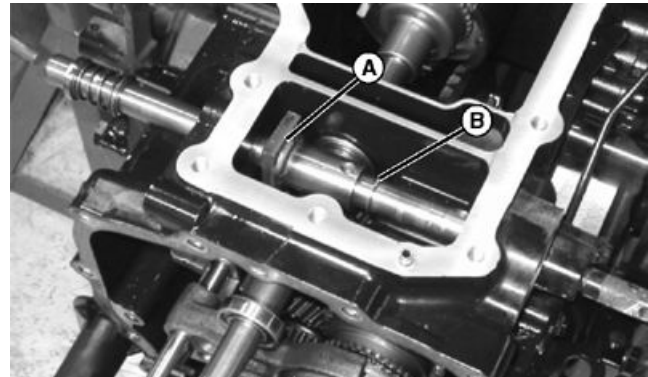
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LVAL12181 —UN—29OCT10

9. Slide the shift shaft into the axle case and install the shift lever (A) and retaining ring (B).

A—Shift Lever

B—Retaining Ring



Shift Shaft

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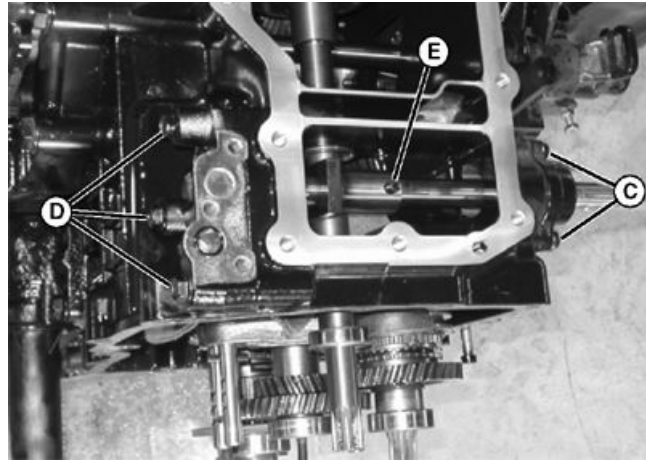
10. Install pivot block and secure with two cap screws (C).
11. Install manifold/shift holder and secure with three cap screws (D).
12. Install the roll pin (E) securing the shift lever to the shift shaft.
13. Align the shift shafts and gear shafts and install center plate and four cap screws around the filter housing. Tighten cap screws to specification.

Specification

Filter Housing Cap
Screw—Torque..... 44—59 N·m (32.4—43.5 lb-ft)

C—Cap Screw (2 used)
D—Cap Screw (3 used)

E—Roll Pin



Pivot Block

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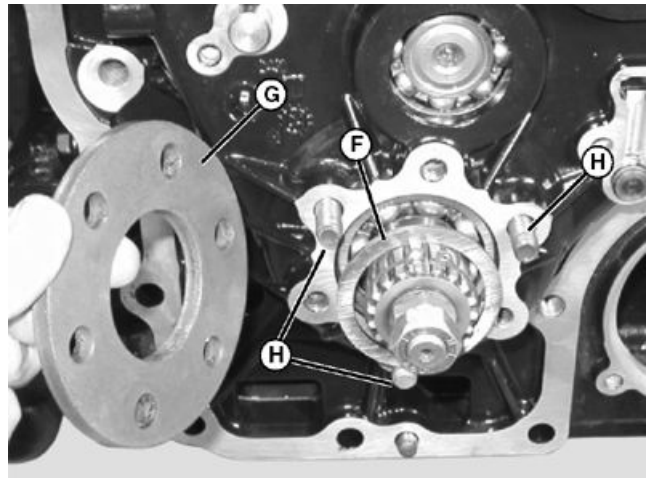
14. Install shim(s) (F) and position retainer plate (G) over drive/pinion shaft and inner retainer plate studs. (See [Differential Pinion Shaft Adjustment](#)) of Final Drive Section to check for shims to be installed.
15. Apply medium strength thread lock to the studs (H) and the three cap screws.
16. Install the three nuts and lock washers onto the studs and install the three cap screws. Tighten all to specification.

Specification

Nuts, Lockwashers, and
Cap Screw—Torque..... 44—59 N·m (32.4—43.5 lb-ft)

F—Shim (as required)
G—Retainer Plate

H—Stud (3 used)



Shims

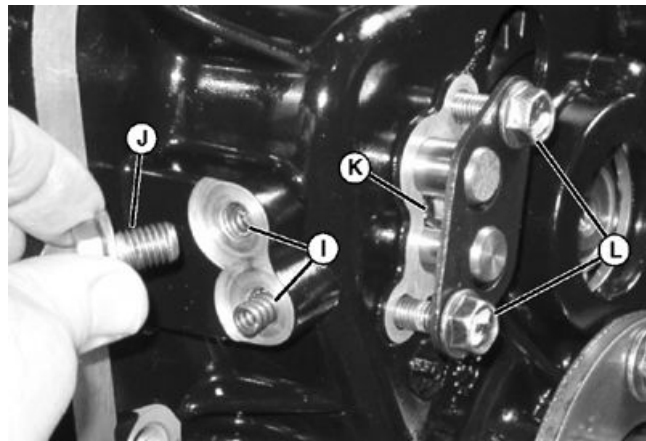
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17. Install the detent balls and springs (I). Install and tighten the two cap screws (J).
18. Install the detent ball (K) and retainer plate and secure with two cap screws (L).

I—Detent Ball and Spring
J—Cap Screw (2 used)

K—Detent Ball
L—Cap Screw (2 used)



Detent Balls and Springs

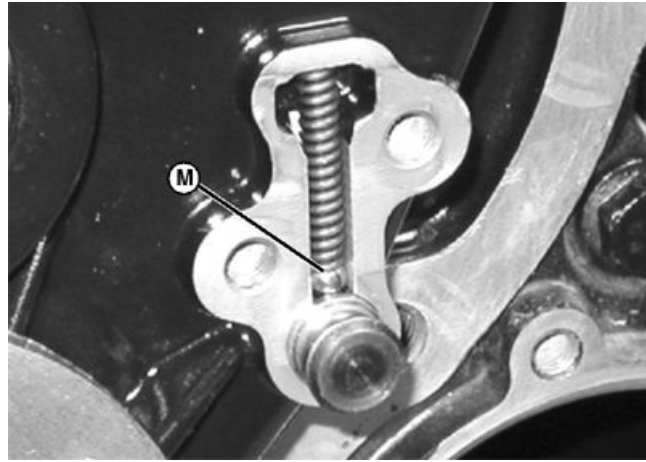
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19. Install the detent ball and spring (M) and retainer plate and secure with two cap screws.
20. Install the PTO and drive shaft couplers.
21. Align the transmission case with the rear axle case.

M—Detent Ball and Spring



Retainer Plate and Cap Screws

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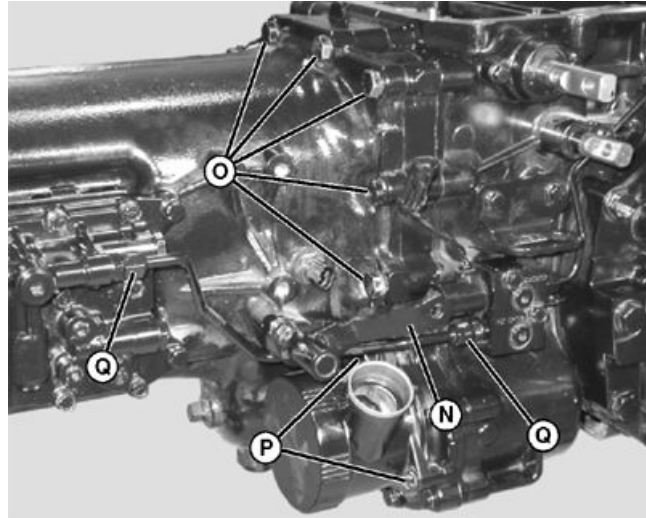
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NOTE: The MFWD coupler detent balls and spring will fall out if the coupler stayed on the drive/pinion shaft during separation of the transmission case. Placing and holding the MFWD lever in the disengaged position will hold the coupler over the detent balls.

22. Check that the MFWD detent balls and spring have remained in place. The MFWD lever (N) should not move up and down easily. If the detent balls need to be installed, (See [MFWD Output Shaft](#).)
23. Place the MFWD lever (N) in the disengaged position.

NOTE: Note the location and length of the transmission case to rear axle case cap screws.

24. Install the twelve cap screws (O) securing the transmission case to the rear axle case. Tighten to specification.
25. Install the hydraulic oil filter case and oil filter. Tighten the cap screws to specification.
26. Install the hydraulic line (Q) to the PTO valve. Tighten to specification.
27. Install the rockshaft. (See [Rockshaft Removal and Installation](#).)
28. Install the SCV. (See [Selective Control Valve \(SCV\)](#) (SN —710000).)
29. Assembly the rear half of the machine to the front half. (See [PRT Machine Splitting \(Rear\)](#).)



MFWD Detent Balls and Springs

N—MFWD Lever
O—Cap Screw (12 used)

Q—Hydraulic Line

Specification

Case to Case Cap	
Screws—Torque.....	79—98 N·m (58—72 lb·ft)
Oil filter Case Cap	
Screws—Torque.....	44—59 N·m (33—44 lb·ft)
Hydraulic Line	
Nuts—Torque.....	40—57 N·m (30—43 lb·ft)

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Section 70 Power Train—Hydrostatic

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General Specifications

Hydrostatic Power Train Specifications:

Item	Measurement	Specification
General:		
Hydraulic Reservoir	Capacity	25.7 L (6.8 gal.) (27.2 qt.)
Hydrostatic Pump:		
Hydrostatic Pump	Manufacturer	Sauer-Danfoss
Hydrostatic Pump	Type	Piston Pump
Hydrostatic Pump	Model	D LVA10837J
Maximum Rev	Displacement (variable)	51 cm ³ /rev (3.11 cu in./rev)
Relief Valve Setting	Pressure	38500 kPa (5580 psi)
Charge	Pressure	1800 kPa (261 psi)
Hydrostatic Motor:		
Hydrostatic Motor	Manufacturer	Sauer-Danfoss
Hydrostatic Motor	Type	Fixed Displacement Axial Piston Motor
Displacement		Fixed 43.5 cm ³ /rev (2.65 cu in./rev)
Forward and Reverse Pressure Relief Valve Plug	Torque	78 N·m (58 lb.-ft.)
Charge Pressure Relief Valve Plug	Torque	78 N·m (58 lb.-ft.)
Charge Pressure Diagnostic Port Plug	Torque	13—16 N·m (115—142 lb.-in.)
Hydrostatic Transmission to Tunnel Mounting Screw	Torque	52—68 N·m (38—50 lb.-ft.)
SCV Pressure Tube to Pump	Torque	55—79 N·m (40—59 lb.-ft.)
SCV Pressure Tube to SCV	Torque	55—79 N·m (40—59 lb.-ft.)
SCV Work Port Tubes to SCV	Torque	40—57 N·m (30—43 lb.-ft.)
Tunnel Section to Differential Housing M12 Cap Screw	Torque	80—98 N·m (59—72 lb.-ft.)
Tunnel Section to Clutch Housing Cap Screw	Torque	126—154 N·m (95—115 lb.-ft.)
Proportional Valve Body	Torque	13—19 N·m (10—14 lb.-ft.)
Solenoid Nut	Torque	3—5 N·m (24—48 lb.-in.)
Trunnion Cover Screw	Torque	31—37 N·m (23—27 lb.-ft.)

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Essential or Recommended Tools

NOTE: Order tools from the *SERVICEGARD™ Catalog*.

ESSENTIAL TOOLS listed are required to perform the job correctly and are obtainable only from the *SERVICEGARD™ Catalog*.

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RECOMMENDED TOOLS, as noted, are suggested to perform the job correctly. Some tools may be available from local suppliers or may be fabricated.

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Splitting Stands and Brackets..... JT07335-1,2,3	Hose With Quick CouplerJT03364
Splitting machine.	Checking system pressure.
2,000 kPa (300 psi) Gauge.....JT03344	7/16-20 M 37° X 7/16-20 M 37° ElbowJT03240
Checking charge pressure.	Checking system and charge pressure.
Hose With Quick CouplerJT03017	Quick Coupler F X 7/16-20 F 37° Adapter.....JT03264
Checking charge pressure.	Checking system and charge pressure.
68947 kPa (10,000 psi) Gauge.....JT03362	Quick Coupler M X M14-1.5 ORB Adapter.....JT05480
Checking system pressure.	Checking system pressure and charge pressure.

SW03989,0000C3F -19-05NOV10-2/2

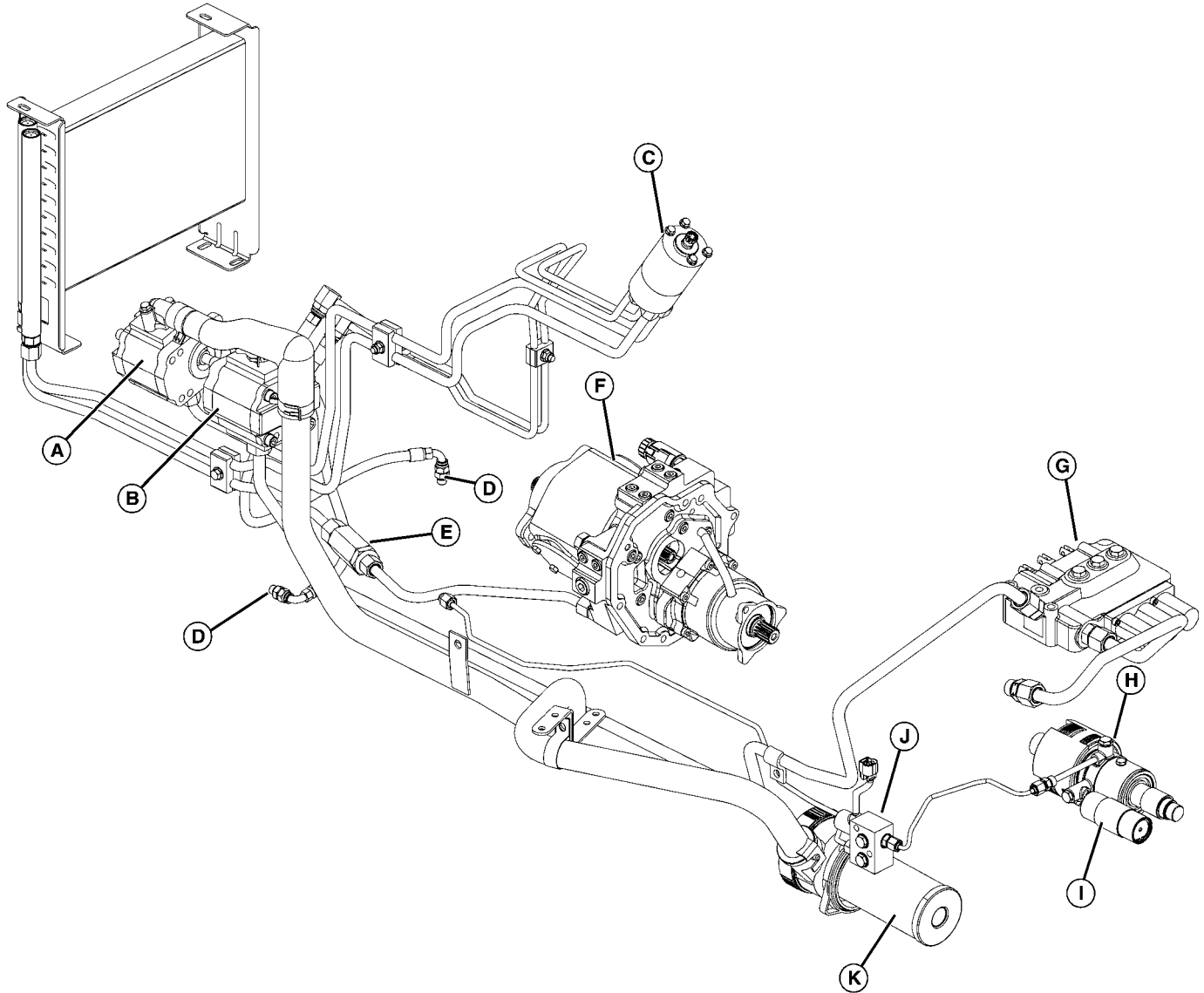
Other Material

Number	Name	Use
PM37509 (U.S.)	John Deere Clean and Cure Primer	Prime Gasket Surfaces for Faster Curing of Form-in-Place Gaskets.
PM38655 Canada PM38625 515 (U.S.®)	Flexible Form-In-Place Gasket	Hydrostatic Transmission to Tunnel seal.
TY15934 (U.S.)	John Deere General Purpose Gasket Dressing	Sealing Gaskets and Hoses

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MM61211,00000C9 -19-12NOV10-1/1

Hydrostatic Machines Component Location



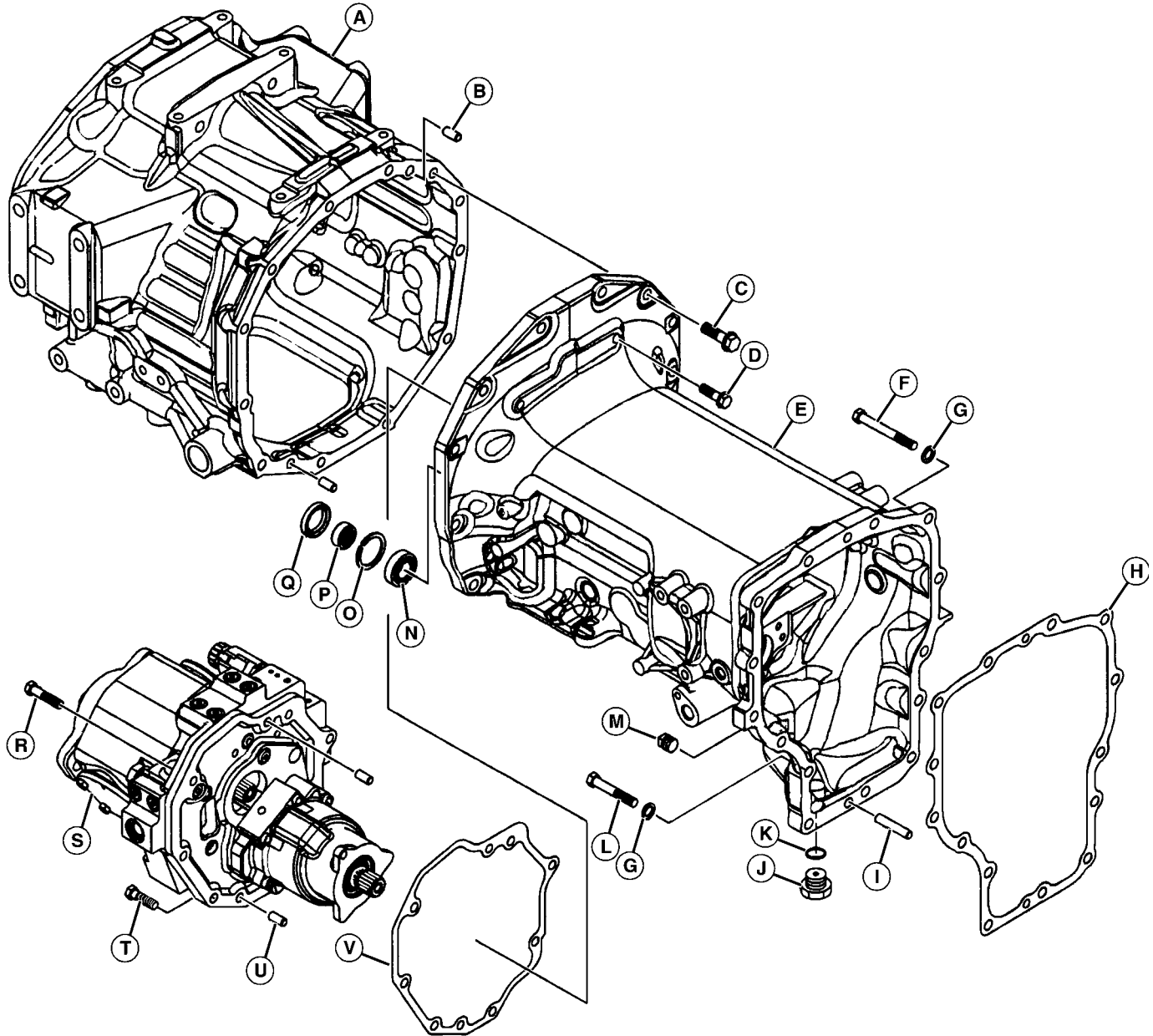
Hydrostatic Component Location

- | | | | |
|-------------------------------|----------------------------------|-----------------------|------------------|
| A—Gear Pump, Steering (Front) | D—Connectors to Steering | G—SCV (3-spool shown) | K—Suction Filter |
| B—Gear Pump, Implement (Rear) | Cylinder | H—PTO Clutch | |
| C—Power Steering Valve | E—Charge Pressure In-Line Filter | I—Accumulator | |
| | F—Hydrostatic Transmission | J—PTO Solenoid Valve | |

LVAL12188 —UN—12NOV10

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Transmission (Hydrostatic)



Transmission (Hydrostatic) Component Location

A—Flywheel Housing
B—Alignment Pin (2 used)
C—Bolt (12 used)
D—Bolt (2 used)
E—Transmission Tunnel

F—Bolt (12 used)
G—Washer (14 used)
H—Gasket
I—Alignment Pin (2 used)
J—Drain Plug
K—O-ring

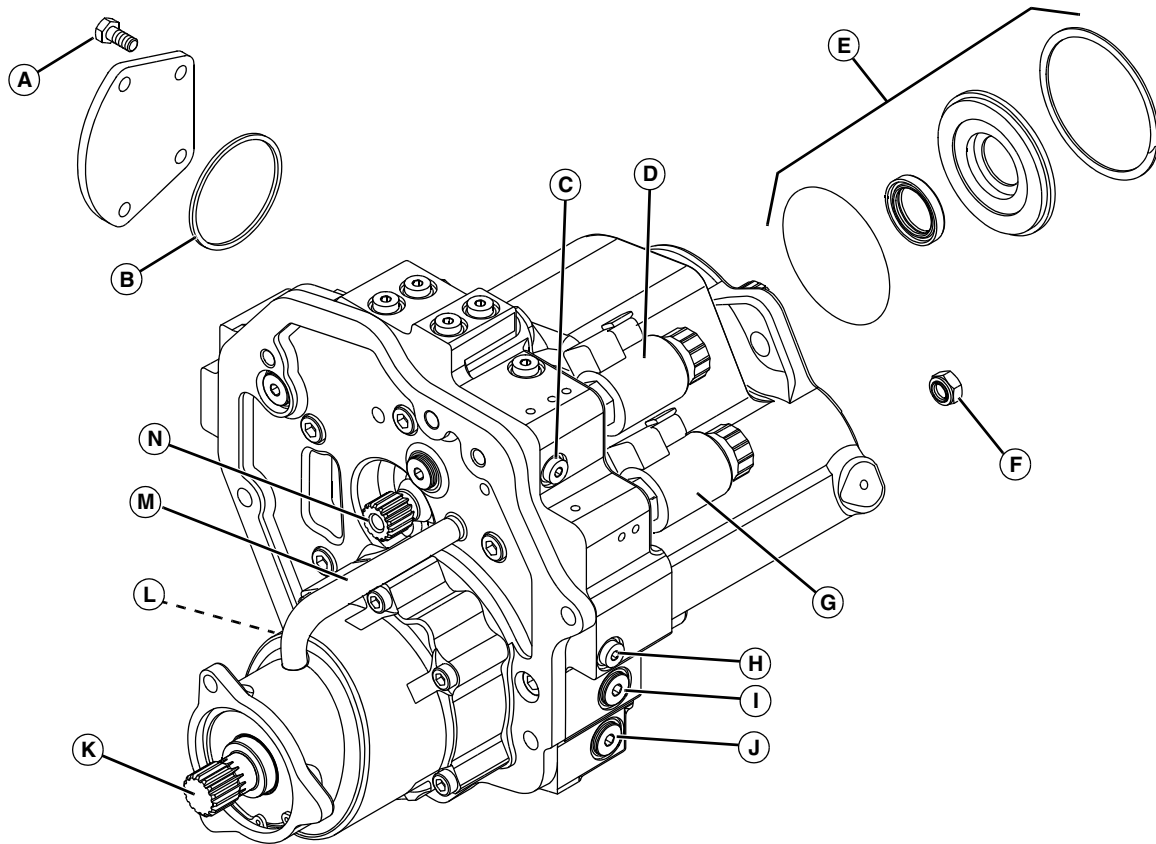
L—Bolt
M—Plug 1/2 NPT
N—Bearing
O—Circlip
P—Sleeve 20x30x13
Q—Oil Seal
R—Bolt (3 used)

S—Transmission
T—Bolt (2 used)
U—Alignment Pin (2 used)
V—Gasket

LVAL12189—UN—12NOV10

SW03989,0000C42 -19-05NOV10-1/1

Hydrostatic Transmission Components



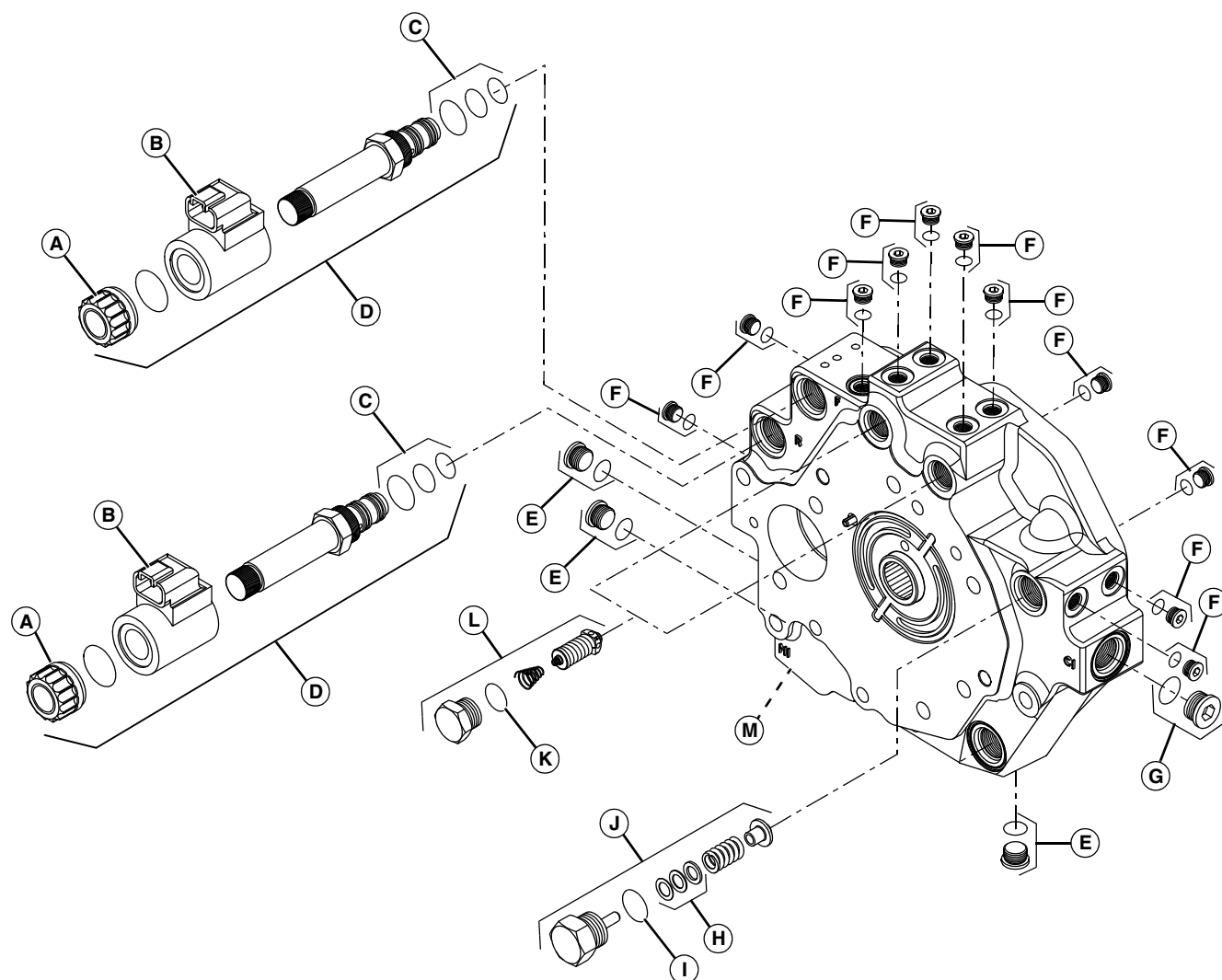
Hydrostatic Transmission Component Location

- | | | | |
|------------------------------------|------------------------------------|-----------------------------------|--------------------------|
| A—Screw | F—Seal Nut | J—Reverse System Pressure Port M1 | N—Output PTO Drive Shaft |
| B—O-ring | G—Reverse Control Valve Solenoid | K—Drive Output Shaft | |
| C—Forward Control Pressure Port M5 | H—Reverse Control Pressure Port M4 | L—Charge Pressure Gauge Port M3 | |
| D—Forward Control Valve Solenoid | I—Forward System Pressure Port M2 | M—Lubrication Tube | |
| E—Input Shaft Seal Kit | | | |

SW03989,0000C43 -19-05NOV10-1/1

LVAL12190 —UN—12NOV10

Hydrostatic Center Plate Components



Hydrostatic Center Plate Component Location

A—Coil Nut (2 used)
B—Coil with Connector (2 used)
C—Solenoid Seal Kit (2 used)

D—Valve Assembly (2 used)
E—Plug Assembly (3 used)
F—Plug Assembly (11 used)

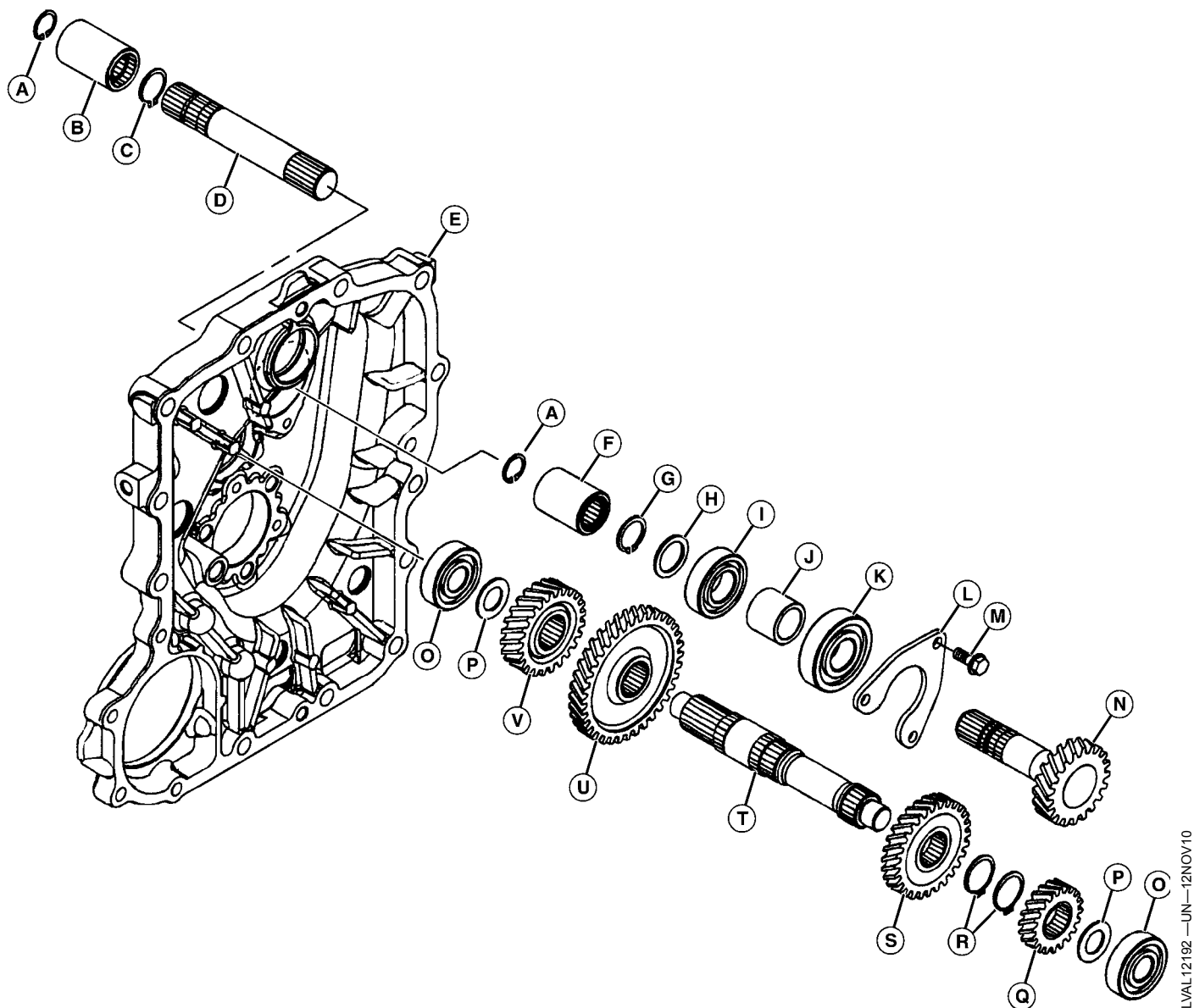
G—Plug Assembly
H—Shim Kit
I—O-ring
J—Charge Relief Valve Kit
K—O-ring

L—System Relief Valve Kit (2 used)
M—System Pressure Port M1

SW03989,0000C44 -19-05NOV10-1/1

LVAL12191 —UN—12NOV10

Drive Shaft Components

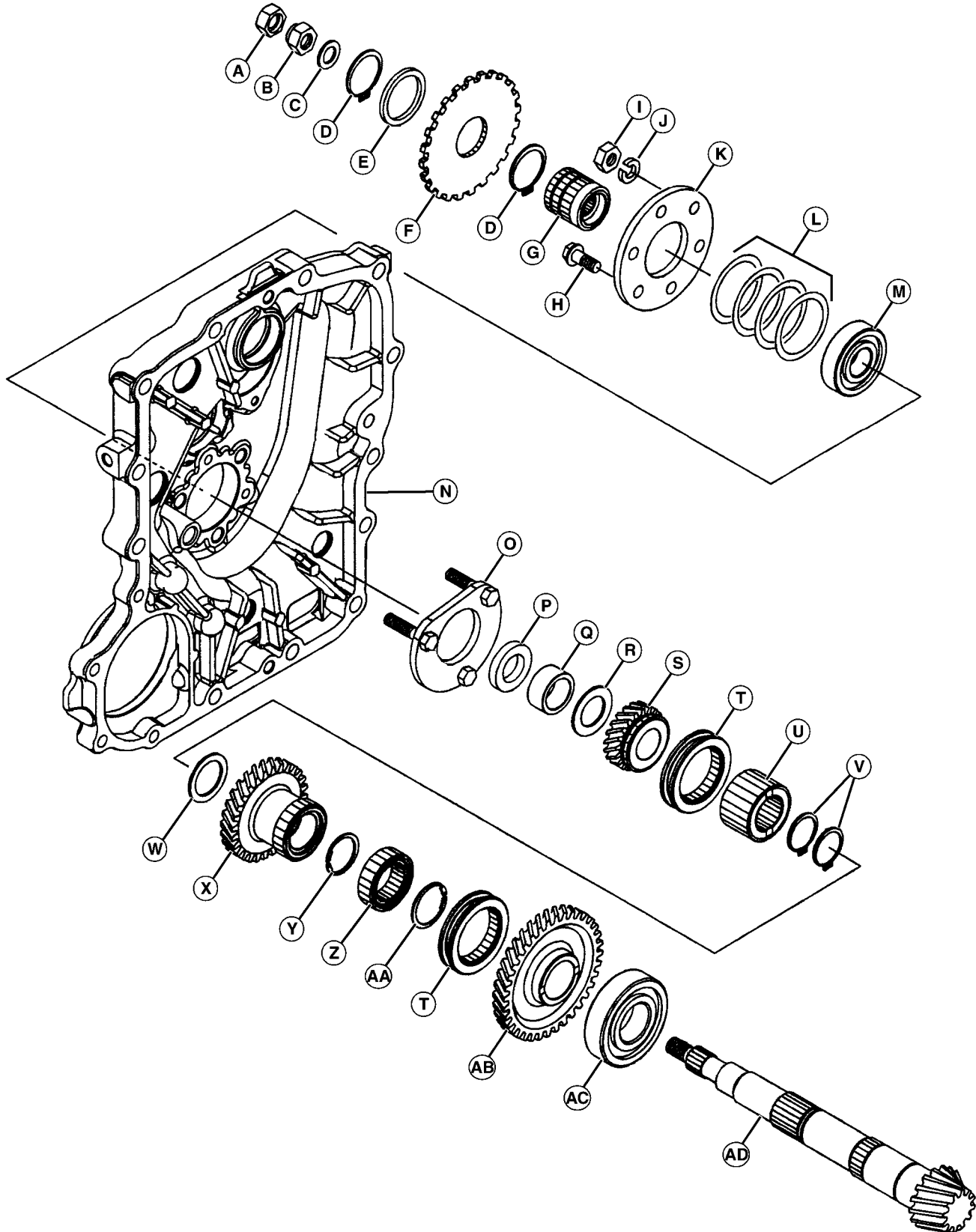


Drive Shaft Component Location

A—Snap Ring (2 used)	G—Snap Ring	N—Main Gear, 20T	S—Range Gear, 26T
B—Coupling (To Transmission)	H—Washer 25x34x2	O—Bearing (2 used)	T—Driven Shaft
C—Snap Ring	I—Bearing	P—Washer 20x34x2 (2 used)	U—Range Gear, 41T
D—Main Drive Shaft	J—Spacer 25x34x29.2	Q—Range Gear, 20T	V—Driven Gear, 24T
E—Center Plate	K—Bearing	R—Snap Ring (2 used)	
F—Coupling (to Main Gear)	L—Bearing Retainer		
	M—Bolt (3 used)		

SW03989,0000C45 -19-05NOV10-1/1

Front Drive Components



Front Drive Component Location

LVAL12193 —UN—12NOV10

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SW03989,0000C46 -19-11NOV10-1/2

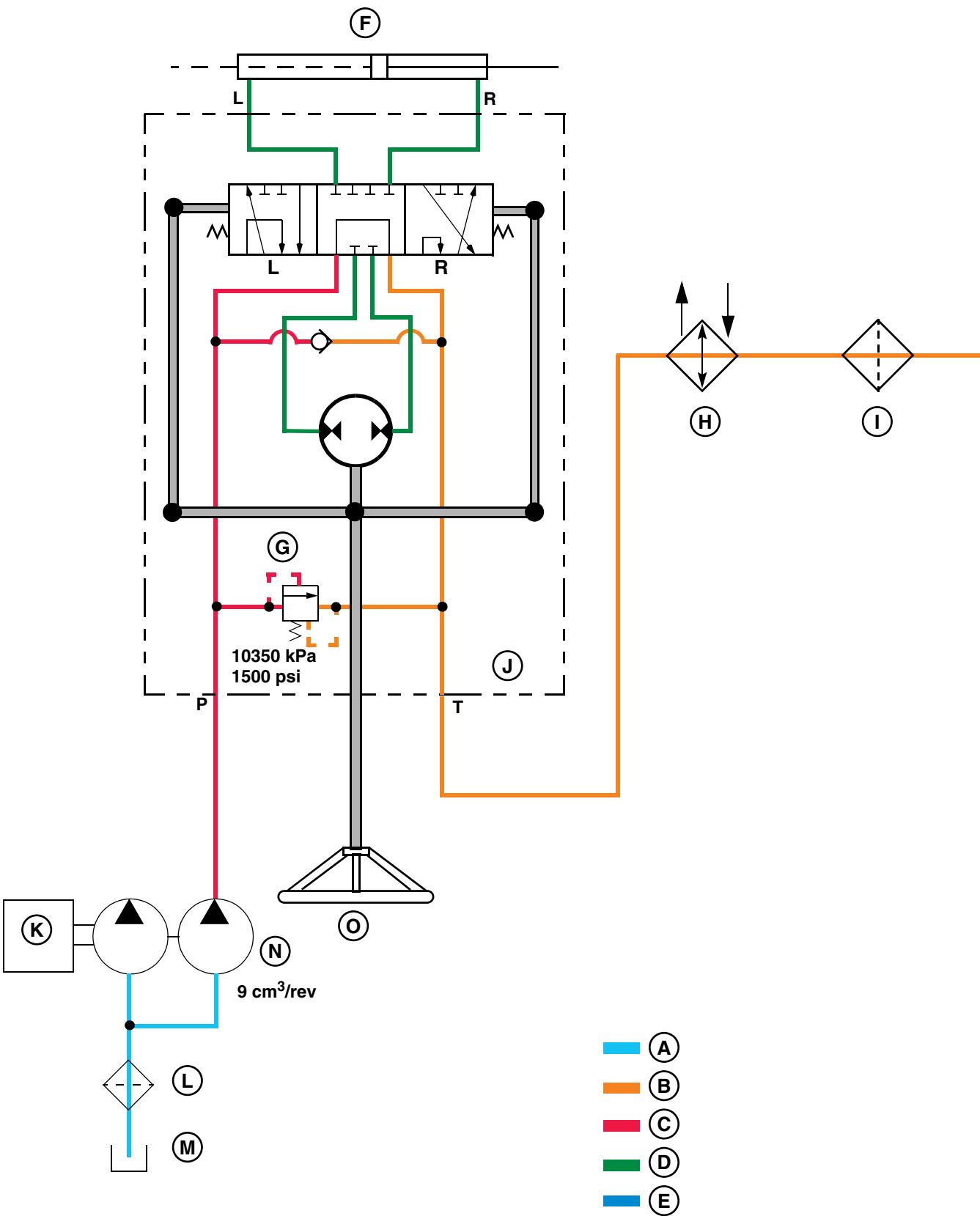
Component Location

A—Nut, Upper	I— Nut (3 used)	Q—Collar	Y—Circlip
B—Nut, Lower	J— Lock Washer (3 used)	R—Washer 28x45x2	Z— Spline Collar
C—Spacer, 15X25X2	K—Retainer Plate	S—Counter Gear, 20T	AA—Circlip
D—Snap Ring (2 used)	L—Shim Kit	T—Shift Collar (2 used)	AB—Counter Gear, 44T
E—Collar	M—Bearing	U—Spline Collar	AC—Bearing
F—Speed Sensing Gear	N—Center Plate	V—Snap Ring (2 used)	AD—Pinion Shaft
G—Spline Collar (MFWD)	O—Bearing Retainer Assembly	W—Washer 32x44x2	
H—Bolt M10x25 (3 used)	P—Washer	X—Counter Gear, 29T	

*NOTE: Shim used from kit will vary for pinion shaft adjustment. (See [Differential Pinion Shaft Adjustment](#) in Section 80, Group 35.)

SW03989,0000C46 -19-11NOV10-2/2

Charge Pump Schematic, Hydro Transmission



Charge Pump Schematic

Continued on next page

SW03989,0000C47 -19-05NOV10-1/4

LVAL12194 —UN—16NOV10

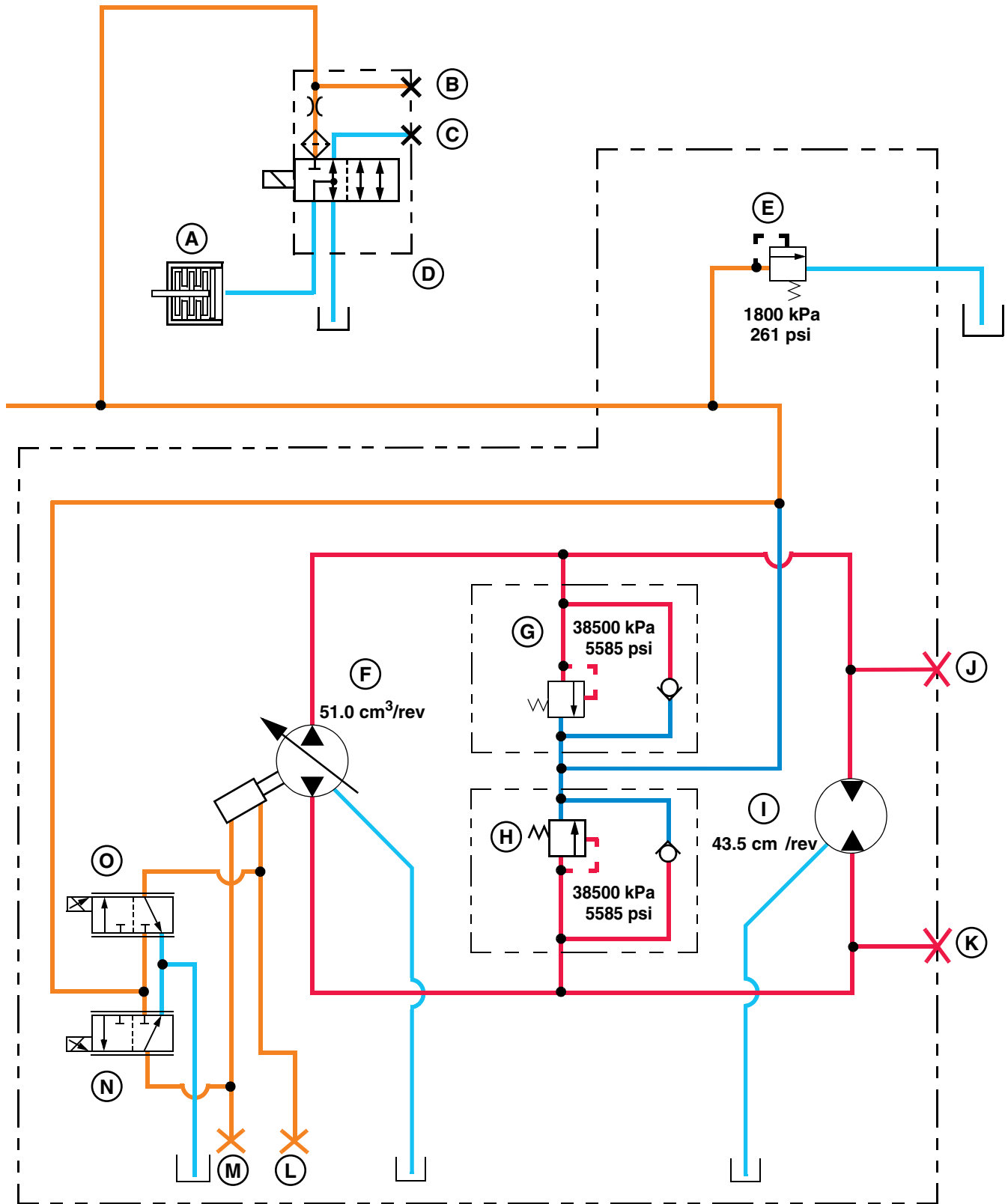
Schematics

- | | | | |
|--|----------------------------------|-------------------------|---------------------|
| A—Sump Oil | D—Steering Oil | H—Oil Cooler | M—Sump |
| B—Charge Pressure/Tunnel Lubrication Oil | E—Make-Up/Closed Loop Relief Oil | I— In-Line Filter | N—Gear Pump (Front) |
| C—High pressure Oil | F—Steering Cylinder | J— Power Steering Valve | O—Steering Wheel |
| | G—Relief valve | K—Engine | |
| | | L— Suction Filter | |

Continued on next page

SW03989,0000C47 -19-05NOV10-2/4

Charge Pump Schematics, Hydro Transmission



Charge Pump Schematic

LVAL12195 —UN—16NOV10

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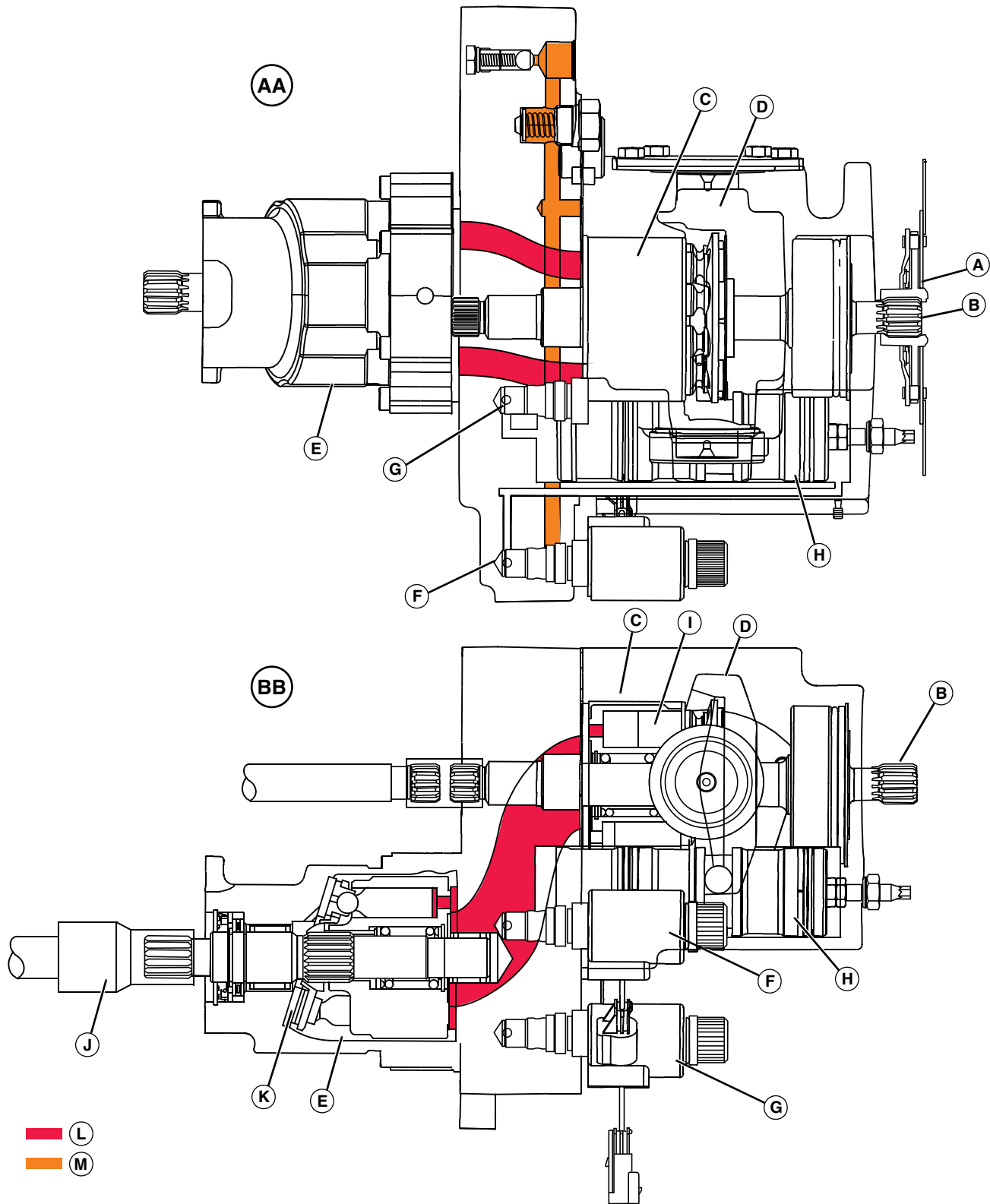
SW03989,0000C47 -19-05NOV10-3/4

Schematics

- | | | | |
|------------------------------|--------------------------------|-------------------------------|-------------------------------|
| A—PTO Clutch | E—Charge Pressure Relief Valve | H—System Relief Valve | O—Proportional Solenoid Valve |
| B—Diverter Valve Port Out | F—Hydro Hydraulic Pump | I— Hydraulic Motor | |
| C—Diverter Valve Port Return | G—System Relief Valve | J— M1 | |
| D—PTO Clutch Solenoid Valve | | K—M2 | |
| | | L— M4 | |
| | | M—M5 | |
| | | N—Proportional Solenoid Valve | |

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Hydrostatic Transmission Operation



Hydrostatic Transmission Operation

Continued on next page

SW03989,0000C48 -19-05NOV10-1/3

LVAL12196 —UN—16NOV10

AA—Top View
BB—Side View
A—Flexible Coupler
B—Input Shaft
C—Hydrostatic Pump
D—Swash Plate

E—Drive Motor
F—Forward Proportional
Pressure Reducing Valve
G—Reverse Proportional
Pressure Reducing Valve

H—Servo Piston
I—Pistons
J—Input Shaft
K—Fixed Swash Plate
L—High Pressure Oil Passages
(forward/reverse)

M—Charge Pressure Oil

Function:

The hydrostatic system transfers power from the engine to the three speed range transmission and then the final drive for the wheels. It provides infinitely variable speed control, forward or reverse, by foot pedal operation.

Principles of Operation:

The hydrostatic system is a closed-loop fluid power system that consists of a charge pump on the left front side of the engine, and a piston pump/motor assembly, which is driven by a flexible coupler (A) attached to the flywheel.

Charge Pump

The charge pump is a gear type positive displacement pump mounted to the left front side of the engine.

This pump provides pressurized fluid to the SCU (Steering Control Unit). Return oil from the SCU is routed through an in-line filter, and then into the hydrostatic pump to provide replacement fluid to the closed-loop of the hydrostatic transmission.

Hydrostatic Pump

The hydrostatic pump is an axial piston, variable displacement piston pump. It is mounted directly to the front of the tunnel. The input shaft (B) splines are driven by the flexible coupler attached to the engine flywheel. Any time the engine is running the input shaft is rotating (and the coupled output shaft to the PTO).

NOTE: The PTO drive shaft is splined to the other end of the input shaft.

The hydrostatic pump (C) is splined to the center of the input shaft. The pistons ride on the swash plate (D). As long as the swash plate is level, the pistons do not move in or out of the drive pump as it rotates.

Oil flow from the cylinder block to the drive motor (E) is controlled by changing the angle of the swash plate. This angle is changed when the forward or reverse pedals are pushed. Pushing a forward or reverse pedal (eHydro™) or drive pedal (Auto HST) will change the output of the pedal position sensor. The voltage value coming from the forward or reverse pedal (eHydro™) or drive pedal and FNR switch (Auto HST) position sensor is fed into the electronic control module. The control module sends a variable signal to the coils on the forward or reverse proportional pressure reducing valves (F and G).

The proportional valves control the flow of hydraulic oil to each end of the servo piston (H) which is directly linked to the swash plate.

NOTE: The control module will only send a signal to a valve coil if all logic input signals are present

within correct value ranges. Only one valve will open at a time. Oil will be provided to only one end of the servo piston at a time.

When a valve opens, hydraulic oil is routed to an end of the servo piston (H). The hydraulic oil moves the servo piston either forward or backward. A pin from the swash plate rides in a groove on the servo piston and the swash plate rotates when the servo piston moves.

As long as the forward and reverse pedals (eHydro™) or the drive pedal (Auto HST) are released, the swash plate is level and no oil is being pumped.

Rotating the swash plate off center changes the distance the pistons (I) travel inside the piston bore of the rotating assembly. Because the input shaft rotates in one direction, the direction that the swash plate is rotated from center determines the direction of fluid flow to the drive motor (forward or reverse). The amount the swash plate is rotated, determines how much fluid will be displaced (speed).

The hydrostatic pump provides hydraulic fluid to the hydrostatic drive motor (E) through passages in the center section. Hydraulic fluid in the power train circulates in a closed-loop. Fluid leaves the hydrostatic pump and flows through the hydrostatic motor and is returned to the hydrostatic pump, not the reservoir. Fluid that leaves this closed-loop circuit, via leakage to case drain, is replenished by fluid from the charge pump. Fluid may also be dumped from the high-pressure side of the loop to the low-pressure side if the machine encounters a heavy load or stalls out. This happens through the high pressure relief valves.

Hydrostatic Motor

The hydrostatic motor (E) is a high torque axial piston motor. The motor is located on the rear of the center section. The hydrostatic motor drives the input shaft (J) for a three speed range gear transmission which transfers power to the wheels. See Final Drive Section.

When high-pressure oil is pumped to the hydrostatic motor it is provided to one side of the motor cylinder or the other. The high-pressure oil forces pistons out of the motor cylinder. The pistons follow the contour of the fixed swash plate (K) creating rotary motion of the motor cylinder. The delivery side determines rotary direction.

The pistons continue to move out of the cylinder and follow the fixed angle swash plate until they are no longer aligned with the oil delivery port. Since oil is no longer being displaced to the pistons, they no longer add to the rotary motion of the motor. But, the next pistons in line are filling with oil and the rotary motion is continued.

Continued on next page

SW03989,0000C48 -19-05NOV10-2/3

As the motor group continues to rotate, its pistons are pressed by the fixed angle swash plate and oil is forced from the piston bores. The displaced oil is returned to the hydrostatic pump through the center section.

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The motor output shaft is splined to the motor and rotates in the same direction as the piston block. The output shaft is splined to the rear transmission input drive shaft (J).

SW03989,0000C48 -19-05NOV10-3/3

Range Transmission Power Flow

Function:

To transfer power from the hydrostatic transmission to the rear axles.

Theory of Operation:

When the Hydro transmission is engaged, there is rotation of the output shaft which is connected to the drive shaft (A) with a splined collar.

The drive shaft is splined to a gear (B) which is constantly engaged to the reduction shaft (C), and directly transfers power to the range gears.

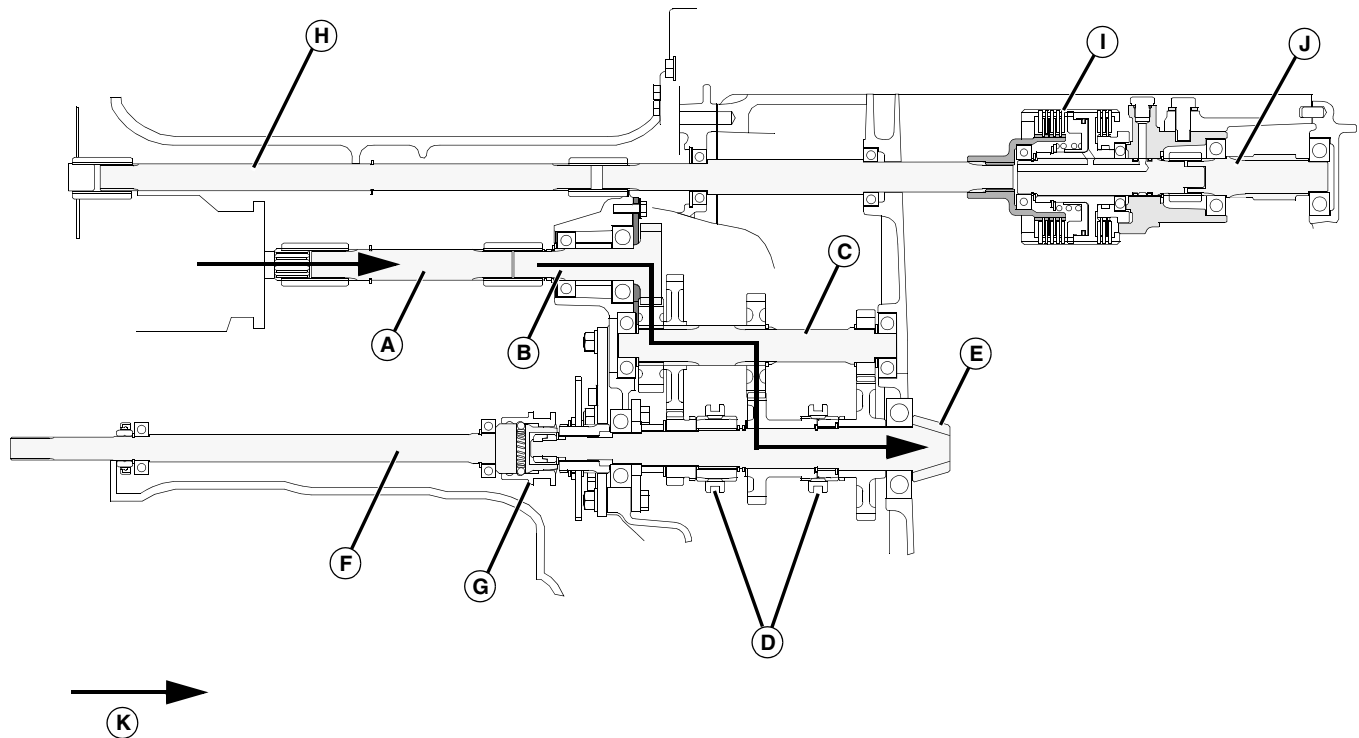
The range transmission shift collars (D) can be shifted to one of four positions (shown in second gear—Range B). The four positions are the three gear ranges and neutral.

(See Range Transmission—eHydro™ in Section 80, Group 15.) in the Final Drive Power Train section. Power is then transferred to the pinion shaft (E) and the rear axles.

Power may be provided to the front wheels through the front drive shaft (F) if the collar shift (G) is engaged to the pinion shaft. (See MFWD Power Operation in Section 80, Group 15.) in the Final Drive Power Train section.

The PTO is operated independent of the eHydro™ transmission. The PTO drive shaft (H) is run through the hydrostatic transmission, but connected directly to the engine splined output shaft.

The PTO drive shaft is coupled to the input of the PTO hydraulic clutch (I). The PTO output shaft (J) provides power from the PTO clutch to the PTO. (See PTO Clutch and Brake Theory of Operation in Section 80, Group 45.) in the Final Drive Power Train section.



A—Drive Shaft
B—Reduction Shaft
C—Range Transmission Shift Collar (2 used)

D—Front Drive Shaft
E—Pinion Shaft
F—Collar Shift
G—PTO Drive Shaft

H—Drive Shaft
I— PTO Hydraulic Clutch
J— PTO Output Shaft

K—Power Flow

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LVAL12197—UN—16NOV10

SW03989,0000C49 -19-11NOV10-1/1

Hydrostatic (eHydro™/AutoHST) Power Train

Test Conditions:

- Operator in Seat
- Engine Off

Symptom	Problem	Solution
Shift Levers and Clutch Pedal	Control pedal(s) do not move freely and return to released position.	Check for debris/damage to pedal(s) or broken return springs.

Test Conditions:

- Operator in Seat

- Engine Running at Slow Idle
- Park Brake Unlocked

Symptom	Problem	Solution
Machine Movement	With the drive pedal(s) released, machine creeps.	Adjust pedal position sensor(s). (See <u>eHydro™—Forward and Reverse Pedal Sensor Test and Adjustment</u> in Section 40, Group 50.)
	With the drive pedal pressed from neutral to maximum travel speed, machine does not accelerate smoothly.	Check that parking brake is fully released.
		Check that range transmission is engaged.
		Check for debris/damage to pedal(s). (See <u>Forward and Reverse Pedals—eHydro™</u> in Section 70, Group 40.)
		Check hydraulic oil for proper level or contamination.
		Check pedal position sensor(s). (See <u>eHydro™—Forward and Reverse Pedal Sensor Test and Adjustment</u> in Section 40, Group 50.)
		Check charge pressure. (See <u>Charge Pump Pressure Test and Adjustment</u> in Section 70, Group 35.)

SW03989,0000C4A -19-11NOV10-1/1

Troubleshooting

Symptom	Problem	Solution
Machine Will Not Move In Forward or Reverse	Hydraulic oil low.	Fill to correct level.
	Parking brake engaged or malfunctioning.	Disengage brake. Repair or replace faulty component.
	Seat switch malfunction.	Test seat switch and wiring.
	Machine operates in only one direction.	Check pedal position sensor(s) for adjustment or calibration. See "Symptom: Machine Will Not Move In Forward" or "Symptom: Machine Will Not Move In Reverse" below.
	Debris under the pedal(s).	Clean pedal sensor area. Test or adjust pedal position sensor(s).
	Charge pressure low.	(See <u>Charge Pump Pressure Test and Adjustment</u> in Section 70, Group 35.) Adjust charge pressure.
	Flex plate coupling between engine and hydrostatic input shaft damaged.	Replace flex plate.
	Internal pump or motor damaged.	Repair or replace components as necessary.
	Transmission failure.	See Final Drive section Troubleshooting and Diagnosis. Repair or replace components as necessary.
	D-N-R switch malfunction. (Auto HST)	Check D-N-R switch and wiring to forward and reverse proportioning valves.
	Proportional valve or pedal calibration incorrect	Multiple electrical component problems possible. (See <u>Entering Diagnostic and Calibration Modes</u> in Section 40, Group 45.)
Symptom	Problem	Solution
Machine Will Not Move in Forward	Machine moves in Reverse only.	HST Check forward pedal position sensor for calibration or malfunction. Repair or replace sensor.
		Auto HST Check D-N-R switch and wiring to forward and reverse proportioning valves.

Continued on next page

SW03989,0000C4B -19-11FEB11-1/3

Symptom	Problem	Solution
		See "Symptom: Machine Will Not Move In Forward or Reverse" above.
	Forward proportional valve malfunctioning.	Replace valve.
	Directional relief valve stuck open.	(See <u>Hydrostatic High Pressure Relief Test</u> in Section 70, Group 35.)
		Replace relief valve.
Symptom	Problem	Solution
Machine Will Not Move in Reverse	Machine moves in Forward only.	HST Check reverse pedal position sensor for calibration or malfunction. Repair or replace sensor.
		Auto HST Check D-N-R switch and wiring to forward and reverse proportioning valves.
		See "Symptom: Machine Will Not Move In Forward or Reverse" above.
	Reverse proportional valve malfunctioning.	Replace valve.
	Directional relief valve stuck open.	(See <u>Hydrostatic High Pressure Relief Test</u> in Section 70, Group 35.)
		Replace relief valve.
Symptom	Problem	Solution
Hydraulic Pump Noisy	Hydraulic oil level low.	Fill to correct level.
	Parking brake set or not releasing.	Disengage brake. Repair or replace faulty component.
	Air in the hydraulic system.	Bleed system. (See <u>Hydraulic System Bleed Procedure</u> in Section 90, Group 30.)
	Charge pressure relief valve stuck open.	(See <u>Charge Pump Pressure Test and Adjustment</u> in Section 70, Group 35.)
		Repair or replace valve.
	Internal pump or motor damaged.	Repair or replace components as necessary

Continued on next page

SW03989,0000C4B -19-11FEB11-2/3

Symptom	Problem	Solution
Sluggish Response To Changes In Speed	Hydraulic oil level low.	Fill to correct level.
	Air in the hydraulic system.	Bleed system. (See Hydraulic System Bleed Procedure in Section 90, Group 30.)
	Debris under the pedals.	Clean pedal sensor area. Test or adjust pedal position sensors.
	Forward or reverse proportional valve malfunctioning.	Replace valve.
	Charge pressure low.	(See Charge Pump Pressure Test and Adjustment in Section 70, Group 35.) Adjust charge pressure.
	Charge pressure relief valve stuck open.	(See Charge Pump Pressure Test and Adjustment in Section 70, Group 35.) Repair or replace valve.
	Internal pump or motor damaged.	Repair or replace components as necessary
Symptom	Problem	Solution
Low Power	Hydraulic oil level low.	Fill to correct level.
	Air in the hydraulic system.	Bleed system. (See Hydraulic System Bleed Procedure in Section 90, Group 30.)
	Charge pressure low.	(See Charge Pump Pressure Test and Adjustment in Section 70, Group 35.) Adjust charge pressure.
	Directional relief valve stuck open.	(See Hydrostatic High Pressure Relief Test in Section 70, Group 35.) Repair or replace relief valve.
	Internal pump or motor damaged.	Repair or replace components as necessary
Symptom	Problem	Solution
Cruise Control Doesn't Work	Parking brake engaged or malfunctioning.	Disengage brake. Repair or replace faulty component.
	Transmission speed sensor malfunctioning.	Test speed sensor. Replace speed sensor as necessary.

SW03989,0000C4B -19-11FEB11-3/3

Troubleshooting

Symptom

Problem

Solution

Load Match Doesn't Work

Transmission speed sensor malfunctioning.

Test speed sensor. Replace speed sensor as necessary.

SW03989,0000C4B -19-11FEB11-4/3

Hydrostatic High Pressure Relief Test

Reason:

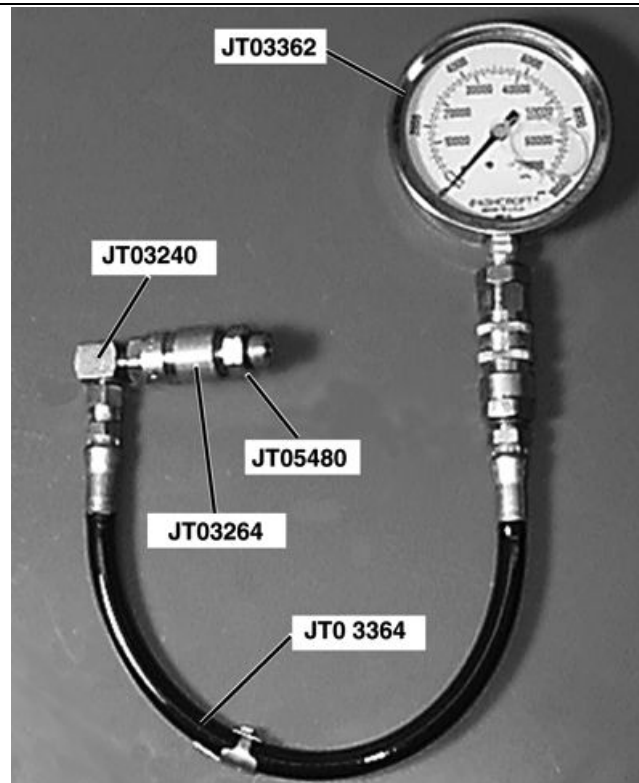
To ensure that internal parts of hydrostatic pump are not worn, and the relief valves are operating properly.

Equipment:

- JT03362 10,000 psi Gauge
- JT03364 Hose
- JT03240 Fitting
- JT05480 Male Quick Coupler
- JT03264 Female Quick Coupler
- JT03252 Adapter

IMPORTANT: Avoid Damage! Make sure that the hydraulic fluid is between “ADD” and “FULL” marks on dipstick. Insufficient hydraulic fluid could damage pump and motor.

IMPORTANT: Avoid Damage! Do not allow valves to relieve for more than 10 seconds or hydraulic oil may overheat.



LVAL12198 —UN—18NOV10

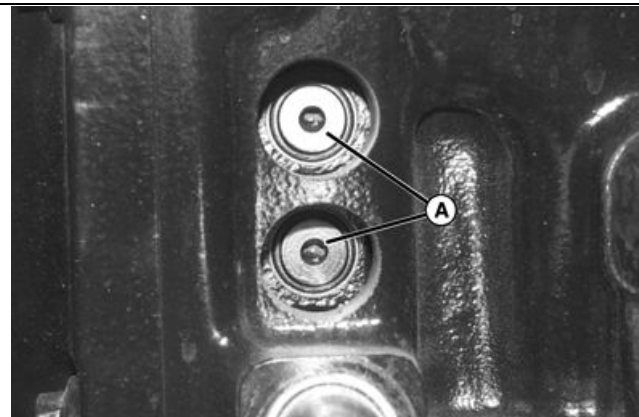
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Procedure:

1. Park machine on a level surface.

CAUTION: Avoid Injury! Machine could move suddenly causing severe injury or damage to equipment during test procedure. Perform test in open area. Keep all personnel away from front or rear of machine.

2. Run machine until hydraulic oil is at operating temperature.
3. Stop engine.
4. Remove right hand brake bellcrank from shaft in order to access test ports. (See [Brake Pedal Assembly Removal and Installation](#) in Section 110, Group 30.)
5. Locate test port access holes on right side of clutch housing. Remove test port plugs (A).



A—Test Port Plug (2 used)

LVAL12198 —UN—18NOV10

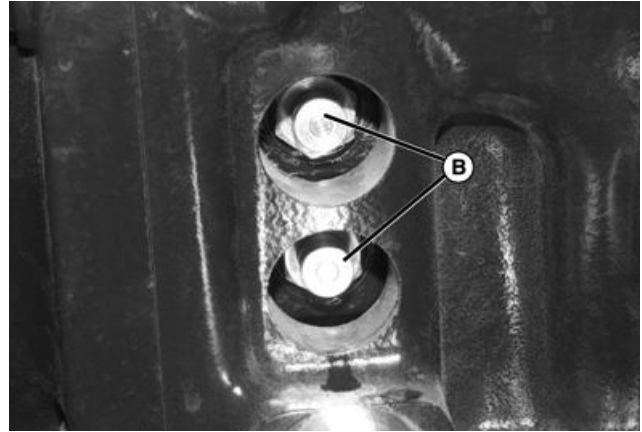
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SW03989,0000C4C -19-11NOV10-2/4

NOTE: Top test port is forward system pressure, bottom test port is reverse.

6. Install a JT05480 male quick coupler (B) into each test port .

B—Male Quick coupler (2 used)



LVAL12200 —UN—18NOV10

SW03989,0000C4C -19-11NOV10-3/4

7. Attach JT03362 gauge and JT03364 hose to each test port adaptor.

NOTE: Make sure the load match switch is OFF. Pressure reading may not get up to relief pressure if switch is ON.

8. Position the gauges so they can be read from operator's seat.
9. Perform test from operator's seat. **Make sure the load match switch is in the OFF position.**

CAUTION: Avoid Injury! Make sure parking brakes are properly adjusted before test. If brakes fail to prevent wheels from turning, STOP TEST IMMEDIATELY. Repair or adjust brakes as necessary before resuming test. See Brake Section.

10. Apply parking brake. Place range transmission shift lever in "C" (high) position. Start engine and run at full throttle.
11. Slowly depress forward pedal (HST) or drive pedal with FNR switch in "F" position (Auto HST) and observe gauge. Gauge should slowly rise to specification and relief valve may open with an audible squealing noise.

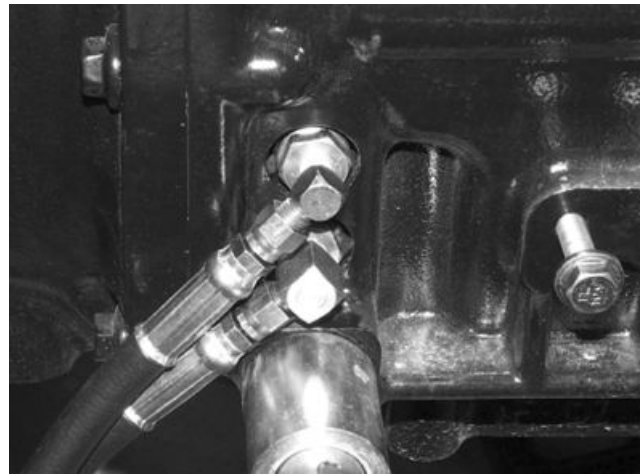
Specification

Hydrostatic
Pump—Pressure..... 38500 kPa (5580 psi)

12. Repeat same procedure with reverse pedal (HST) or drive pedal with FNR switch in "R" position (Auto HST). Pump pressure should reach specification in either direction and then relieve.

Specification

Hydrostatic
Pump—Pressure..... 37128—38500 kPa (5385—5580 psi)



LVAL12201 —UN—18NOV10

Results:

- If pressure does not reach specification in either direction, check charge pressure. (See Charge Pump Pressure Test and Adjustment in Section 70, Group 35.)
- If pressure will reach specification in one direction and not the other, one of the relief valves is defective or the seat is leaking.
- If charge pressure is good and hydrostatic pump pressure will not get up to relief pressure in both directions, hydrostatic pump is worn or damaged and must be replaced. Internal parts on hydrostatic transmission assembly are not serviceable. Remanufactured transmissions are available and must be replaced as complete units.

SW03989,0000C4C -19-11NOV10-4/4

Charge Pump Pressure Test and Adjustment

Reason:

To ensure that charge pump is operating at specified pressure to supply oil to hydrostatic pump.

Equipment:

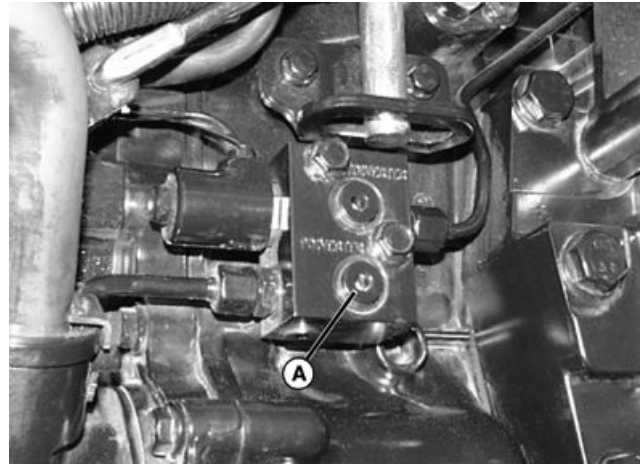
- JTO5480—M14 x 1.5 Male Quick Coupler
- JTO7041—2760 kPa (400 psi) Gauge
- JTO3017—Hose
- JTO 3472—Female Quick Coupler

Procedure:

1. Park machine on a level surface and set park brake.
2. Shift transmission to NEUTRAL.
3. Place PTO switch OFF.

CAUTION: Avoid Injury! Make sure to relieve system pressure before loosening any system lines or hoses.

4. Cycle all controls to relieve any pressure that may be in the hydraulic system.
5. Locate the PTO clutch solenoid valve on left side of the machine (above hydraulic suction filter).
6. Remove plug from PTO clutch solenoid valve pressure port (A).
7. Install quick connect fitting. Install hose and pressure gauge to fitting.
8. Start engine and run at high idle.
9. Check pressure gauge for charge pressure.
10. Stop machine.
11. Cycle all controls to relieve any pressure that may be in the hydraulic system.



PTO Clutch Solenoid Valve Pressure Port

A—PTO Clutch Solenoid Valve Pressure Port

12. Remove test gauge and fittings.
13. Install plug in port (A).

Results:

- Charge pressure should reach specification.

Specification

Charge—Pressure..... 1500—2000 kPa (217—290 psi)

- If minimum pressure reading of 1500 kPa (217 psi) cannot be obtained;
- Mesh in-line strainer may be restricted,
- Suction line filter may be restricted,
- Front hydraulic pump may be defective,
- Hydraulic oil may be too hot, or
- Charge pressure relief valve is damaged or leaking.

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SW03989,0000C4D -19-05NOV10-1/3

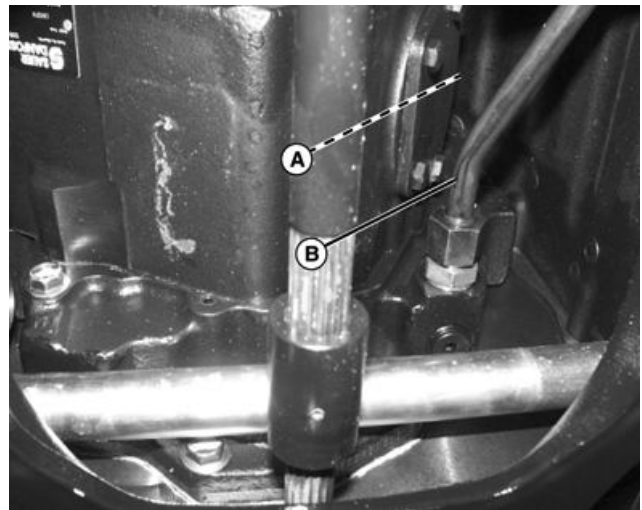
LVAL12202 —UN—18NOV10

Adjustment:

1. Remove charge pressure line (B).
2. Remove charge pressure relief valve cap (A).

A—Charge Pressure Relief
Valve Cap

B—Charge Pressure Line



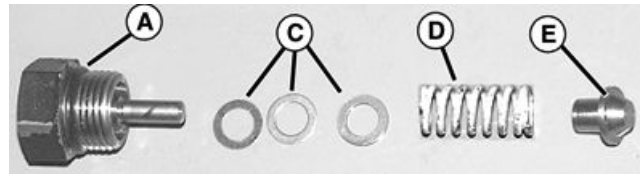
Charge Pressure Relief Valve

LVAL12203 —UN—18NOV10

SW03989,0000C4D -19-05NOV10-2/3

3. Inspect cap (A), shims (C), spring (D) and poppet (E). Carefully examine seating area of poppet and seat in transmission block. Replace worn or damaged parts.
4. Shims come in various thicknesses. Add shims to increase pressure, remove shims to decrease pressure.
5. Replace O-ring on cap when reinstalling.

LVAL12204 —UN—18NOV10



Charge Pressure Relief Valve

A—Cap
C—Shim (3 used)

D—Spring
E—Poppet

SW03989,0000C4D -19-05NOV10-3/3

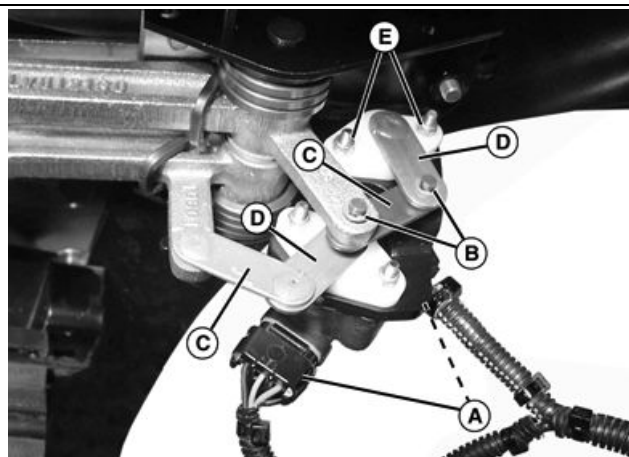
Forward and Reverse Pedal Sensors—eHydro™

Removal:

This procedure applies to one or both of the position sensors.

IMPORTANT: Avoid Damage! Do not loosen or remove position sensors unless they need to be replaced. The position sensor output must be properly calibrated for logic controller function. If the position sensor is not set within the correct output range, the machine will not operate forward or reverse.

1. Safely park machine.
2. Locate and remove cover from pedal bracket located under operator's floor platform.
3. Mark wiring harness connectors (A) and position sensor(s) to aide re-connection. Disconnect wiring harness.
4. Remove E-clips (B) from link(s) (C) connecting the rotary arm (D) to the pedal arm. Disconnect the link from the rotary arm.



A—Wiring Harness Connector (2 used)
B—E-Clip (2 used)
C—Link (2 used)
D—Rotary Arm
E—Lock Nut (2 used)

5. Remove lock nuts (E). Remove rotary arm assembly.
6. Remove position sensor.

SW03989,0000C4F -19-11NOV10-1/2

7. Remove E-clip from rotary arm and remove arm from cover. Replace O-ring (I) and (H) before reassembly.

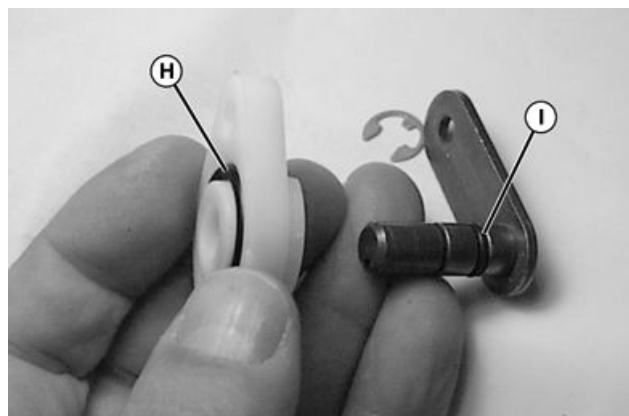
Installation:

NOTE: The forward and reverse position sensors must be accurately set after replacement. (See eHydro™—Forward and Reverse Pedal Sensor Test and Adjustment in Section 40, Group 50.)

1. Install cap screws through position sensor and place in bracket. Install rotary arm and cover. As needed, use a small amount of grease to hold O-ring(s) in place during assembly.
2. Install lock nuts. Tighten just enough that the position sensor will stay in place without turning, but can be rotated by hand.
3. If removed, repeat steps for second position sensor and rotary arm assembly.

IMPORTANT: Avoid Damage! Torque specification is critical.

4. Perform position sensor calibration. Tighten lock nuts to specification.



H—O-ring

I— O-ring

Specification

Lock Nut— Torque..... 3.4 N·m (30 lb-in.)

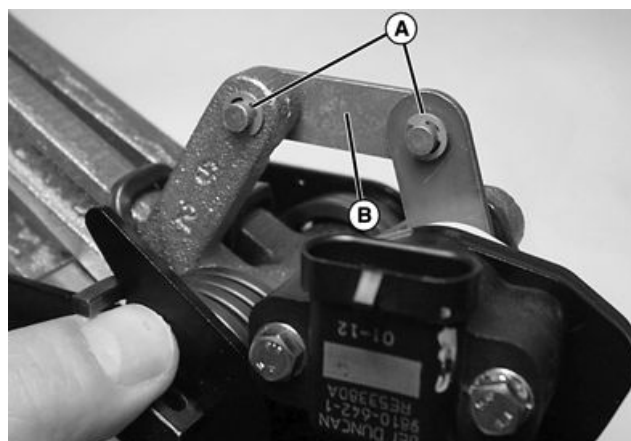
5. Install cover.

SW03989,0000C4F -19-11NOV10-2/2

Forward and Reverse Pedals—eHydro™

Disassembly:

1. Safely park machine.
2. Remove forward and reverse pedals.
3. Locate and remove cover from forward and reverse pedal bracket under floor operator's platform.
4. Remove operator's platform. See procedure in Miscellaneous section.
5. Mark wiring harness connectors and forward and reverse position sensors for aide in installation. Disconnect wiring harness connectors from forward and reverse position sensors.
6. Remove socket head cap screws and forward and reverse foot pedals from arms.
7. Remove three cap screws securing pedal assembly to foot deck.
8. Remove E-clips (A) securing the link (B) between the reverse pedal and position sensor. Remove link.



Reverse Pedal Link

A—E-Clips

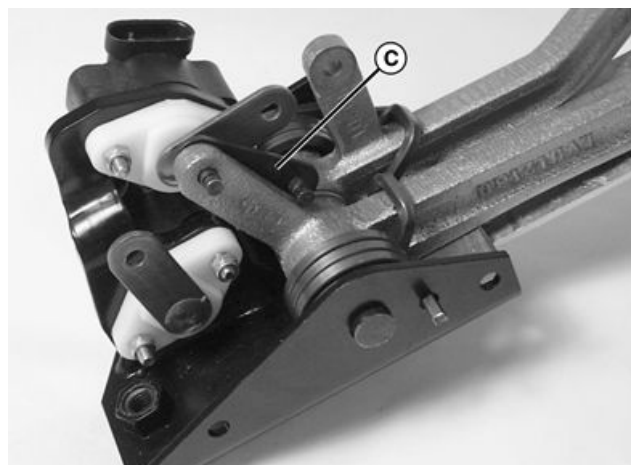
B—Link

LVAL12207 —UN—18NOV10

SW03989,0000C50 -19-05NOV10-1/13

9. Remove E-clips securing second link (C). Remove link end from position sensor arm and rotate the link against the forward pedal.

C—Link



Position Sensor Link

LVAL12208 —UN—18NOV10

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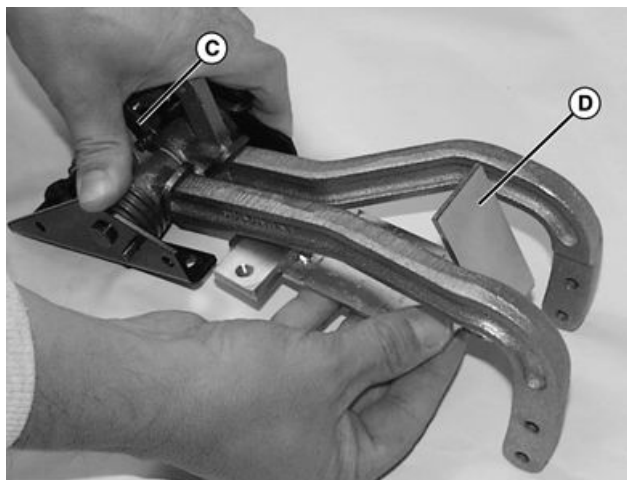
SW03989,0000C50 -19-05NOV10-2/13

10. Place pedal assembly on a hard flat surface. Push center of assembly down (compressing springs) until pedal stop bracket (D) can be removed. Release assembly allowing springs to relax.

11. Remove link (C) from forward pedal.

C—Link

D—Pedal Stop Bracket



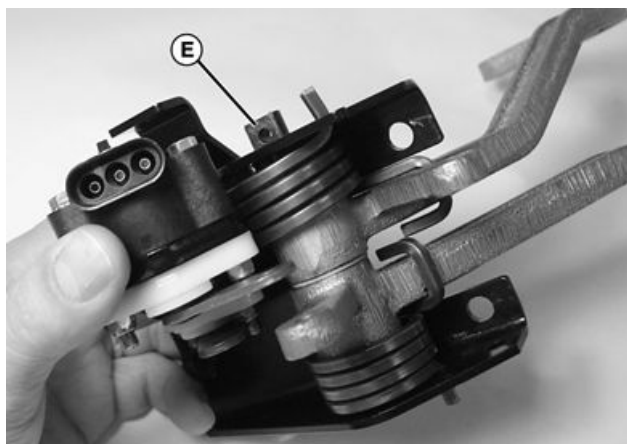
Pedal Assembly

SW03989,0000C50 -19-05NOV10-3/13

LVAL12209 —UN—18NOV10

12. Remove pin securing drilled pedal shaft (E) in bracket. Slide axle out of bracket. Remove reverse pedal, washer, forward pedal and shaft.

E—Drilled Pedal Shaft



Drilled Pedal Shaft

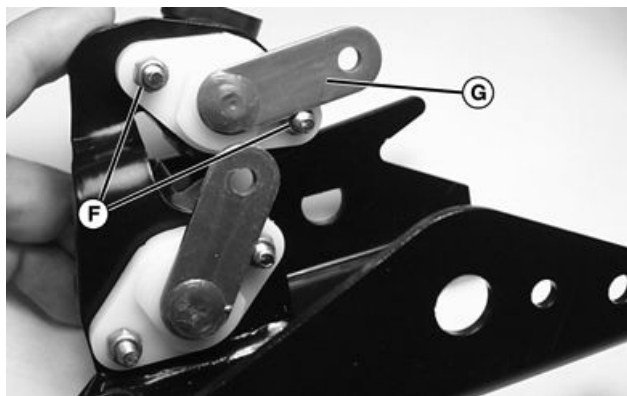
SW03989,0000C50 -19-05NOV10-4/13

LVAL12210 —UN—18NOV10

13. Remove lock nuts (F) and cap screws from position sensor. Remove rotary arm and cover assembly (G).

F—Lock Nut (2 used)

G—Cover Assembly



Cover Assembly

SW03989,0000C50 -19-05NOV10-5/13

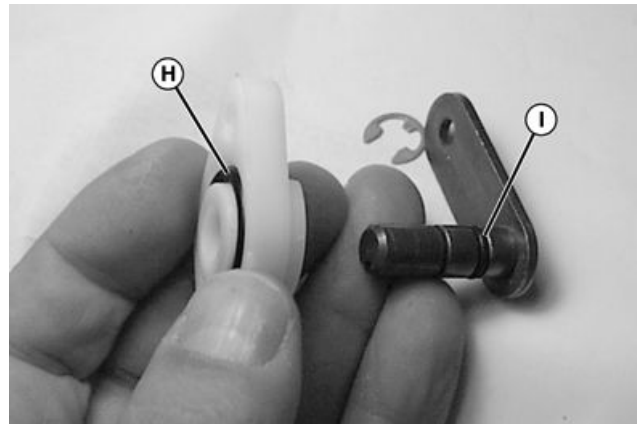
LVAL12211 —UN—18NOV10

Continued on next page

14. Remove E-clip from rotary arm and remove arm from cover. Replace O-ring (I) and (H) before reassembly.

H—O-ring

I— O-ring



O-rings

LVAL12212 —UN—18NOV10

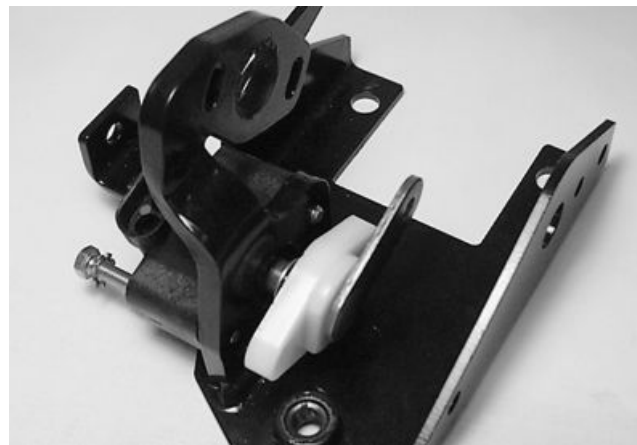
SW03989,0000C50 -19-05NOV10-6/13

Assembly:

NOTE: The forward and reverse position sensors must be accurately set after replacement. See "eHydro™ Test and Set-up Procedures in the Electrical section.

1. Install cap screws through position sensor and place in bracket. Install rotary arm and cover. As needed, use a small amount of grease to hold O-ring(s) in place during assembly.
2. Install and tighten lock nuts enough that the position sensor will stay in place without turning, but can be rotated by hand.
3. Repeat steps for second position sensor and rotary arm assembly.

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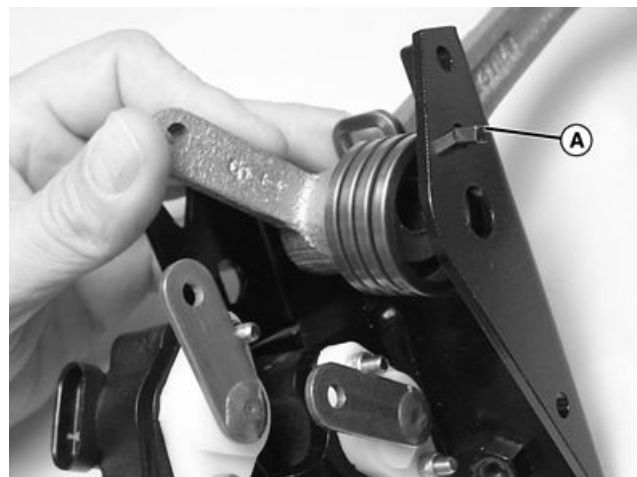
Position Sensor Cap Screws

LVAL12213 —UN—18NOV10

SW03989,0000C50 -19-05NOV10-7/13

4. Install springs to pedals. Hold forward pedal in bracket and place end of spring (A) through hole in bracket.

A—Spring



Spring

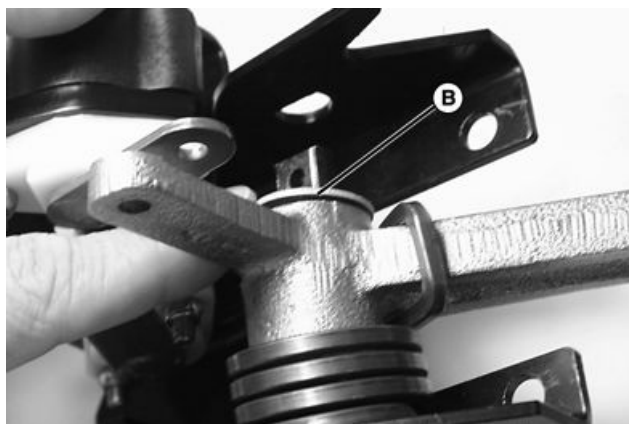
LVAL12214 —UN—18NOV10

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SW03989,0000C50 -19-05NOV10-8/13

5. Slide pedal shaft through bracket and forward pedal. Install washer (B) onto shaft.
6. Place reverse pedal into position and pedal shaft through pedal and bracket. Secure shaft in place with pin.

B—Washer



Washer

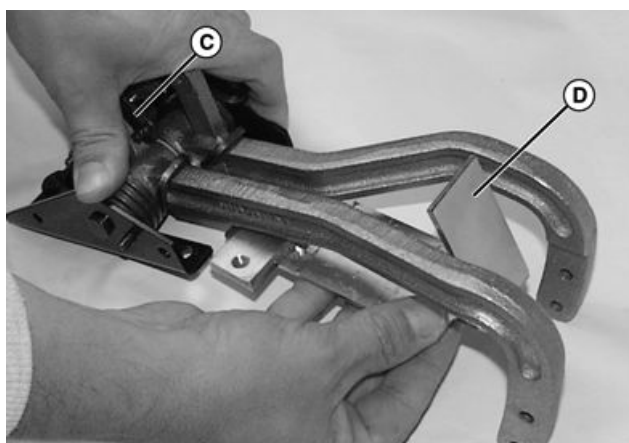
LVAL12215 —UN—18NOV10

SW03989,0000C50 -19-05NOV10-9/13

7. Install link (C) and rotate until resting on pedal arm. Place assembly on hard flat surface and press down center until pedal stop (D) can be slid into place.

C—Link

D—Pedal Stop



Pedal Stop

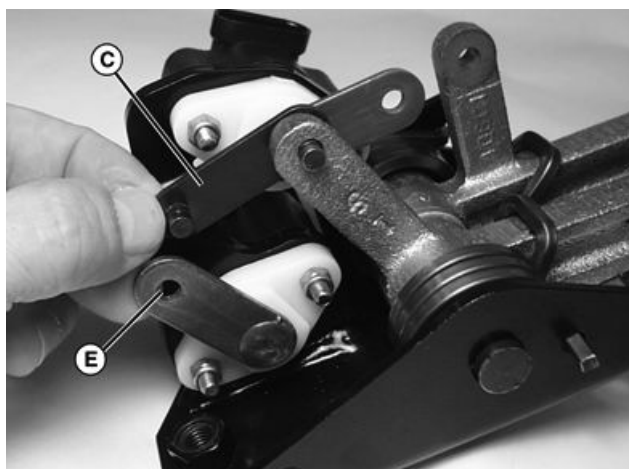
LVAL12216 —UN—18NOV10

SW03989,0000C50 -19-05NOV10-10/13

8. Rotate link (C) and place it through hole in rotary arm (E). Secure link with two E-clips.

C—Link

E—Rotary Arm



Rotary Arm Link

LVAL12217 —UN—18NOV10

Continued on next page

SW03989,0000C50 -19-05NOV10-11/13

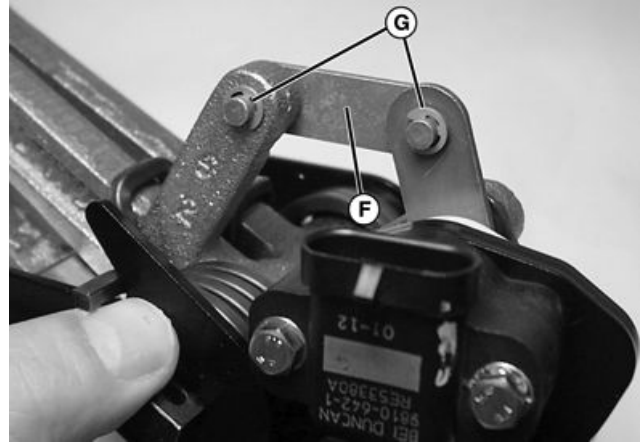
9. Install second link (F) between reverse pedal and rotary arm. Secure link with E-clips (G).
10. Secure assembly
11. Calibrate position sensors to correct positions. Tighten lock nuts to specification.

Specification

Lock Nut—Torque..... 3.4 N·m (30 lb.-in.)

F—Link

G—E-Clip (2 used)



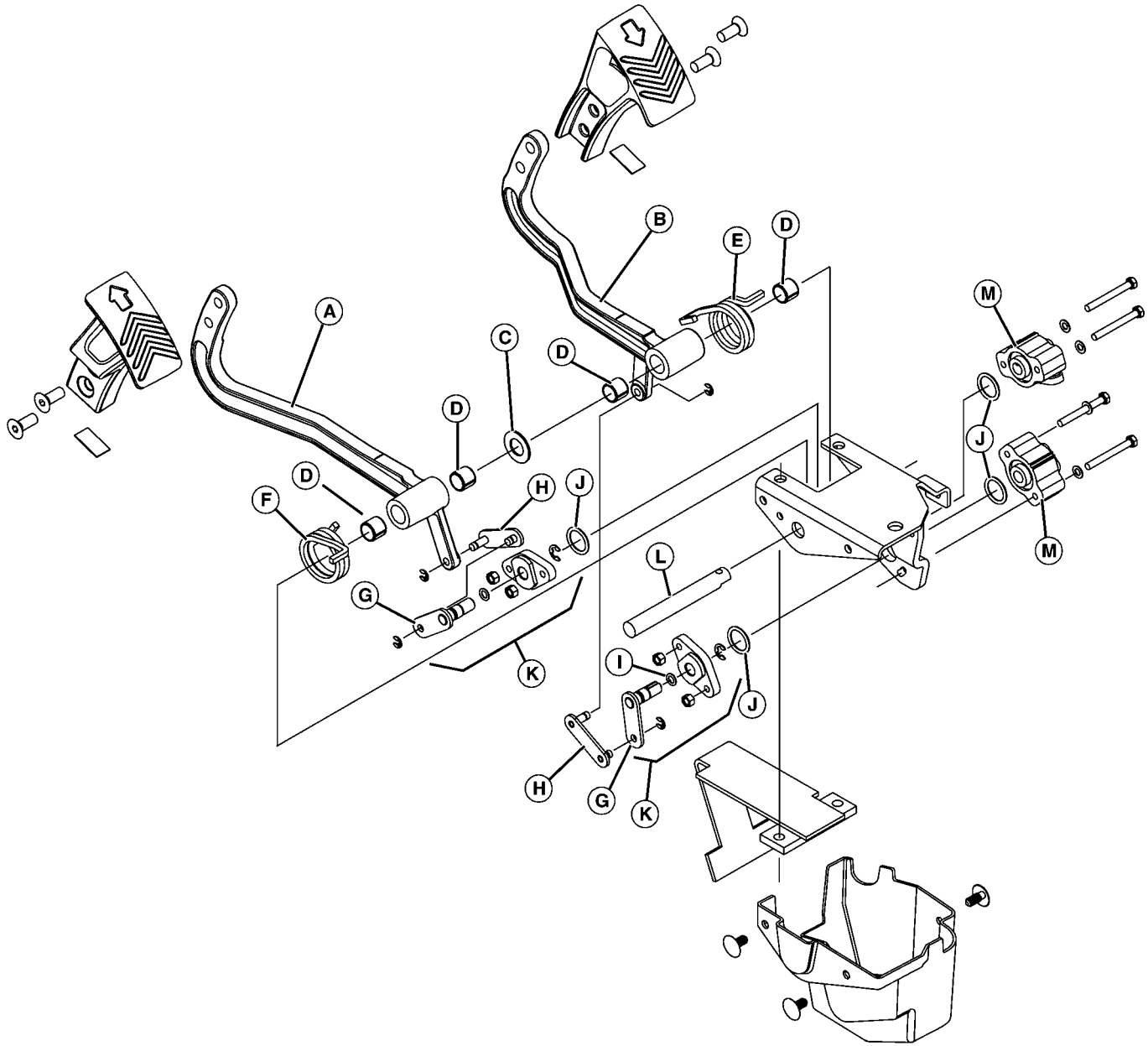
Reverse Pedal Link

LVAL12218 —UN—18NOV10

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SW03989,0000C50 -19-05NOV10-12/13

Forward and Reverse Pedals Components



Forward and Reverse Pedals Components

A—Forward Pedal Arm
B—Reverse Pedal Arm
C—Washer, Non-Metallic
D—Bushing (2 used per Pedal)

E—Spring, Forward Torsion
F—Spring, Reverse Torsion
G—Rotary Arm

H—Link
I— O-ring
J— O-ring
K—Rotary Arm Assembly (2 used)
L— Pedal Shaft

M—Position Sensor (2 used)

SW03989,0000C50 -19-05NOV10-13/13

LVAL12219 —UN—12NOV10

Drive Pedal Sensor—AutoHST

Removal:

IMPORTANT: Avoid Damage! Do not loosen or remove position sensor except for replacement. The position sensor output must be precisely calibrated for logic controller function. If the position sensor is not set within the correct output range, the machine will not operate forward or reverse.

1. Safely park machine.
2. Locate and remove cover from pedal bracket located under operator's floor platform.
3. Mark and disconnect wiring harness connector (A).



Wiring Harness Connector

A—Wiring Harness Connector

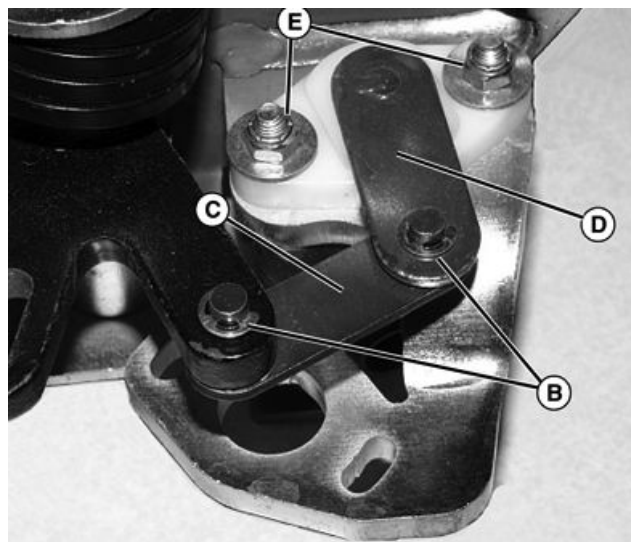
LVAL12220—UN—18NOV10

SW03989,0000C51 -19-11NOV10-1/5

4. Remove E-clips (B) from link (C) connecting the rotary arm (D) to the pedal arm. Disconnect the link from the rotary arm.
5. Remove lock nuts and washers (E).

B—E-Clip (2 used)
C—Link

D—Rotary Arm
E—Lock Nut (2 used) and
Washer (2 used)



E-Clips

LVAL12221—UN—18NOV10

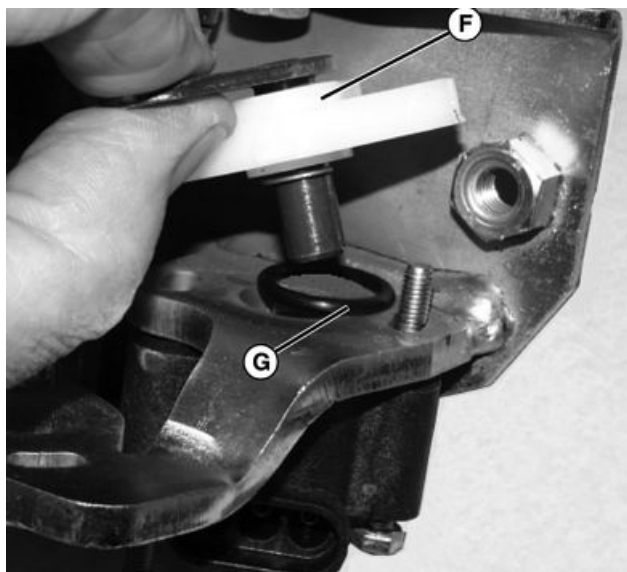
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SW03989,0000C51 -19-11NOV10-2/5

6. Remove the rotary arm and cover assembly (F) and O- ring (G).

F—Rotary Arm and Cover Assembly

G—O-ring



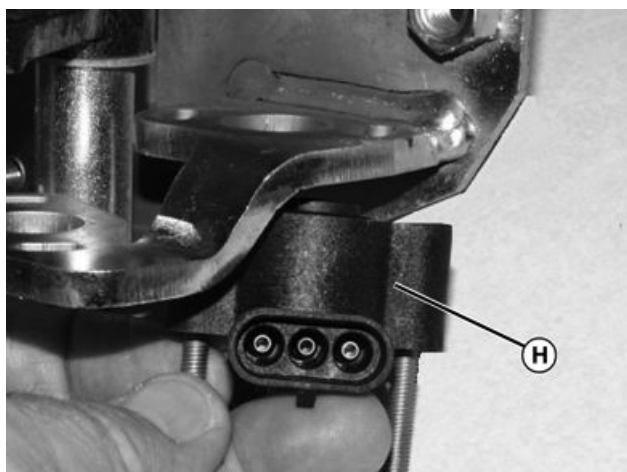
LVAL12222 —UN—18NOV10

Rotary Arm and Cover Assembly

SW03989,0000C51 -19-11NOV10-3/5

7. Remove position sensor (H).

H—Position Sensor



LVAL12223 —UN—18NOV10

Position Sensor

Continued on next page

SW03989,0000C51 -19-11NOV10-4/5

8. Remove E-clip from rotary arm and remove arm from cover. Replace O-ring (H) and (I) before reassembly.

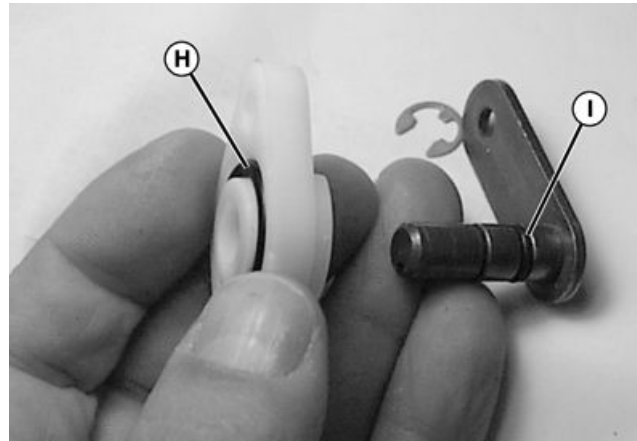
Installation:

NOTE: The pedal position sensor must be accurately set after replacement. (See Auto HST—Drive Pedal Sensor Test and Adjustment in Section 40, Group 50.)

1. Install cap screws through position sensor and place in bracket. Install rotary arm and cover. As needed, use a small amount of grease to hold O-ring(s) in place during assembly.
2. Install washers and lock nuts. Tighten just enough that the position sensor will stay in place without turning, but can be rotated by hand.
3. Install link and E clips.

IMPORTANT: Avoid Damage! Torque specification is critical.

4. Perform position sensor calibration. Tighten lock nuts to specification.



O-rings

H—O-ring

I—O-ring

Specification

Lock Nut—Torque..... 3.4 N·m (30 lb-in.)

5. Install cover.

SW03989,0000C51 -19-11NOV10-5/5

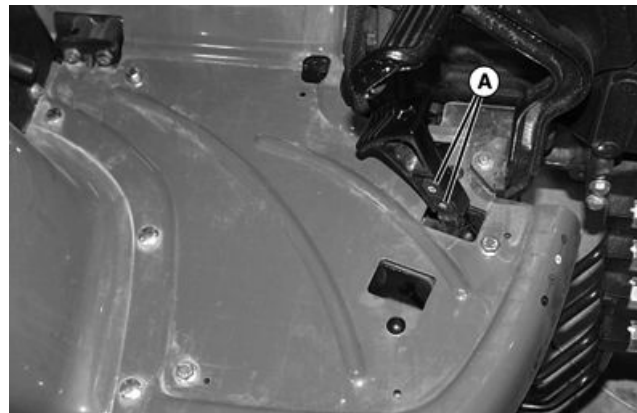
LVAL12224—UN—18NOV10

Drive Pedal—AutoHST

Disassembly:

1. Park machine safely.
2. Remove rubber floor mat from operator's platform.
3. Remove two tapered socket head screws (A) and remove top of drive pedal.
4. Locate and remove cover from pedal bracket under floor of operator's platform.
5. Remove operator's platform. See procedure in Miscellaneous section.

A—Tapered Socket Head Screw
(2 used)



Tapered Socket Head Screws

Continued on next page

SW03989,0000C52 -19-05NOV10-1/18

LVAL12225—UN—18NOV10

6. Mark and disconnect wiring harness connector (B).

B—Wiring Harness Connector



Wiring Harness Connector

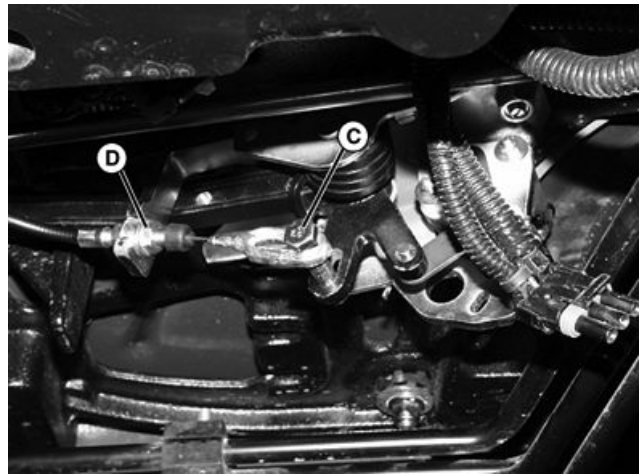
LVAL12226—UN—18NOV10

SW03989,0000C52 -19-05NOV10-2/18

7. Remove shoulder bolt (C) from pedal arm. Loosen jam nut (D) on throttle cable and remove cable from bracket.

C—Shoulder Bolt

D—Jam Nut



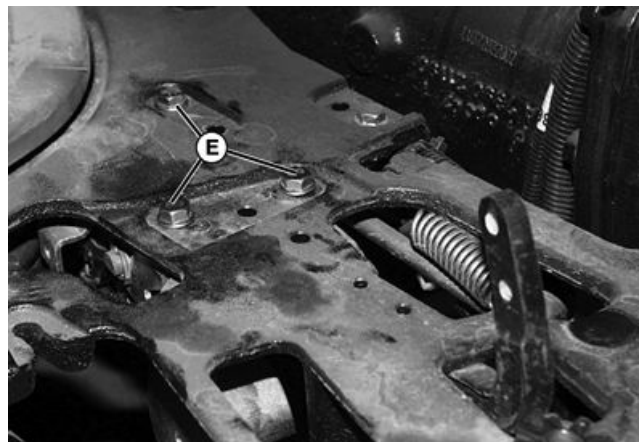
Pedal Arm

LVAL12227—UN—18NOV10

SW03989,0000C52 -19-05NOV10-3/18

8. Remove three bolts (E) securing pedal assembly. Remove pedal assembly and place on workbench.

E—Bolts (3 used)



Pedal Assembly Bolts

LVAL12228—UN—18NOV10

Continued on next page

SW03989,0000C52 -19-05NOV10-4/18

9. Remove E-clips (F) securing the link (G) between the pedal and position sensor. Remove link.

F—E-Clip (2 used)

G—Link



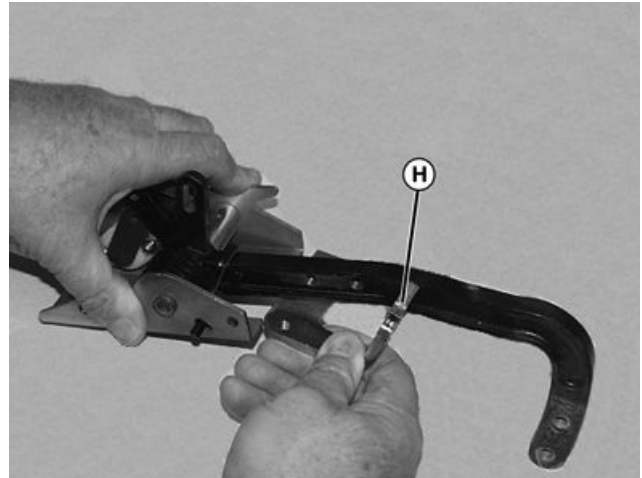
E-Clips

LVAL12229 —UN—18NOV10

SW03989,0000C52 -19-05NOV10-5/18

10. Place pedal assembly on a hard flat surface. Push center of assembly down (compressing spring) until pedal stop bracket (H) can be removed. Release assembly allowing spring to relax.

H—Pedal Stop bracket



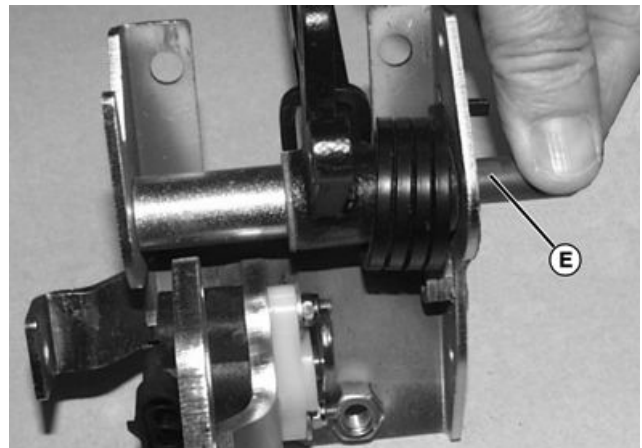
Pedal Assembly

LVAL12230 —UN—18NOV10

SW03989,0000C52 -19-05NOV10-6/18

11. Remove cotter pin securing drilled pedal shaft (I) in bracket. Slide shaft out of bracket.

I— Drilled pedal Shaft



Pedal Shaft

LVAL12231 —UN—18NOV10

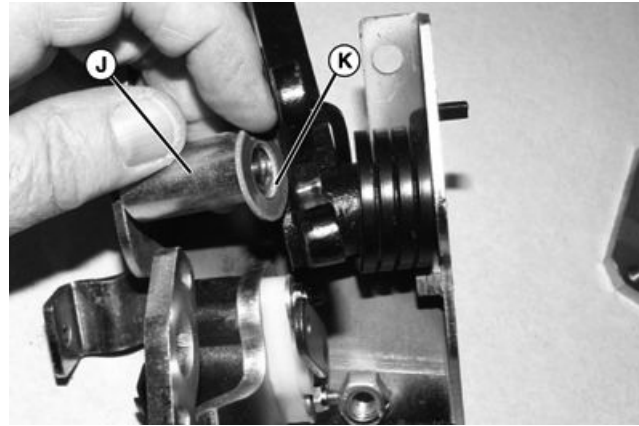
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SW03989,0000C52 -19-05NOV10-7/18

12. Remove spacer (J) and washer (K).

J—Spacer

K—Washer



Spacer

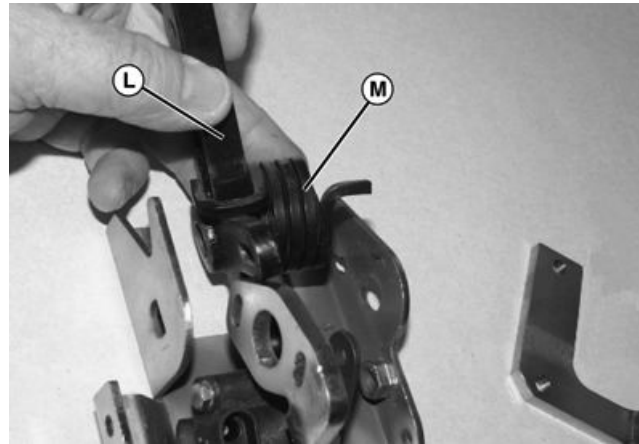
LVAL12232—UN—18NOV10

SW03989,0000C52 -19-05NOV10-8/18

13. Remove pedal (L) and spring (M).

L—Pedal

M—Spring



Pedal

LVAL12233—UN—18NOV10

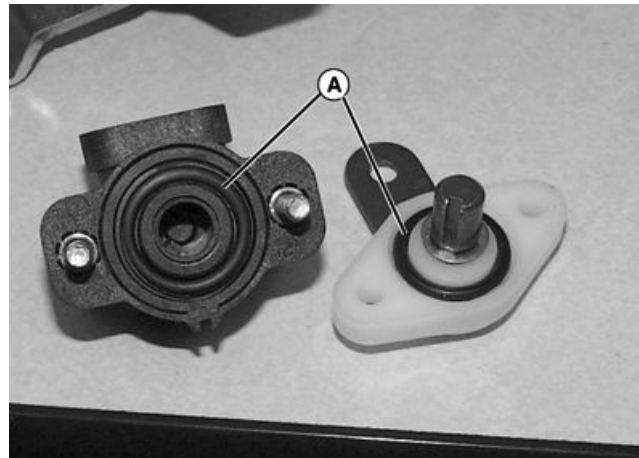
SW03989,0000C52 -19-05NOV10-9/18

Assembly:

NOTE: The pedal position sensor must be accurately set after replacement. See "eHydro™ Test and Set-up Procedures in the Electrical section.

1. If the pedal position sensor was removed, apply a light film of grease on O-rings (A) to help keep them in place during assembly. Install the O-rings on the sensor and cover.

A—O-ring (2 used)



O-rings

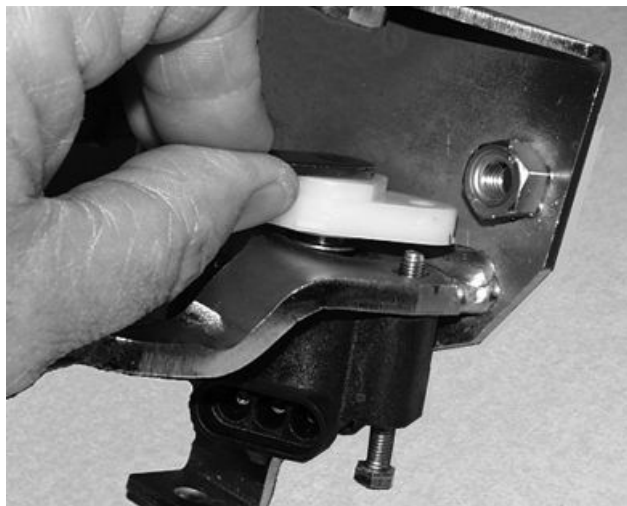
LVAL12234—UN—18NOV10

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SW03989,0000C52 -19-05NOV10-10/18

2. Install cap screws through position sensor and slots in bracket. Install rotary arm and cover.
3. Install washers and lock nuts. Tighten lock nuts enough that the position sensor will stay in place without turning, but can be rotated by hand.



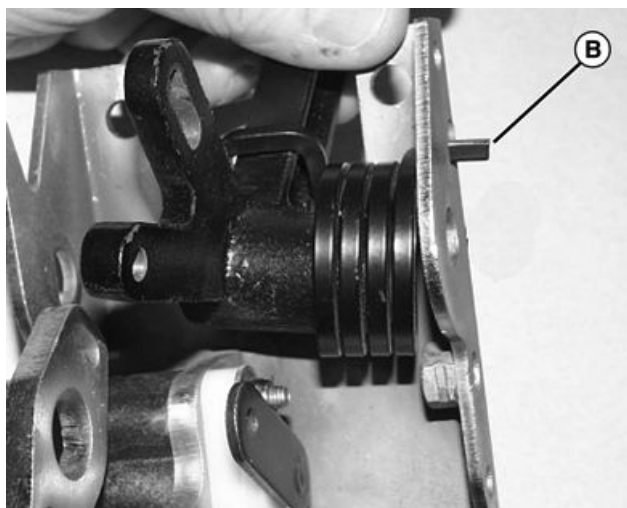
Position Sensor

LVAL12235—UN—18NOV10

SW03989,0000C52 -19-05NOV10-11/18

4. Install spring to pedal. Hold pedal in bracket and place end of spring (B) through hole in bracket.

B—Spring



Spring

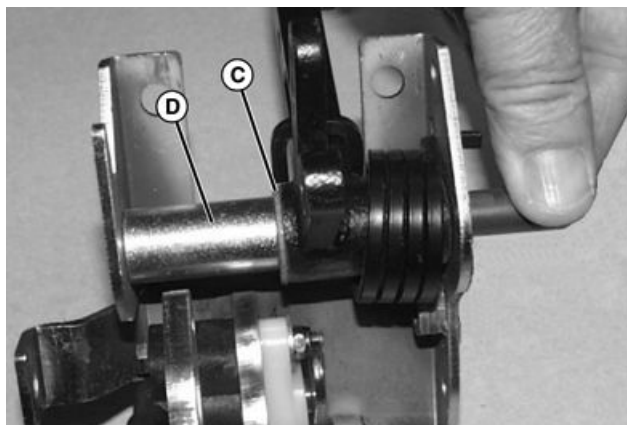
LVAL12236—UN—18NOV10

SW03989,0000C52 -19-05NOV10-12/18

5. Slide pedal shaft through bracket and pedal. Install washer (C) and spacer (D) onto shaft.
6. Secure shaft in place with cotter pin.

C—Washer

D—Spacer



Washer and Spacer

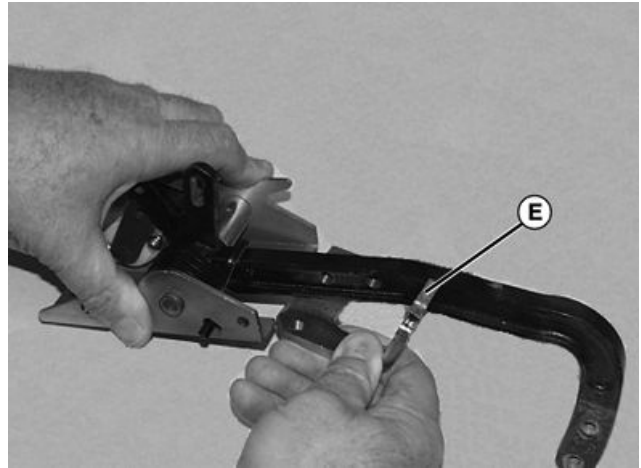
LVAL12237—UN—18NOV10

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SW03989,0000C52 -19-05NOV10-13/18

7. Place assembly on hard flat surface and press down center until pedal stop (E) can be slid into place.

E—Pedal Stop



Pedal Stop

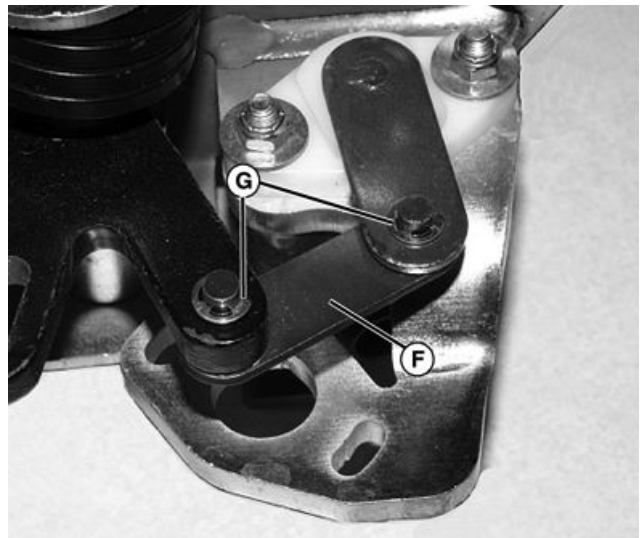
LVAL12238 —UN—18NOV10

SW03989,0000C52 -19-05NOV10-14/18

8. Install link (F) and secure link with two E-clips (G).

F—Link

G—E-Clip (2 used)



Link

LVAL12239 —UN—18NOV10

SW03989,0000C52 -19-05NOV10-15/18

9. Install pedal assembly to support with three bolts (H).

H—Bolts (3 used)



LVAL12240 —UN—18NOV10

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SW03989,0000C52 -19-05NOV10-16/18

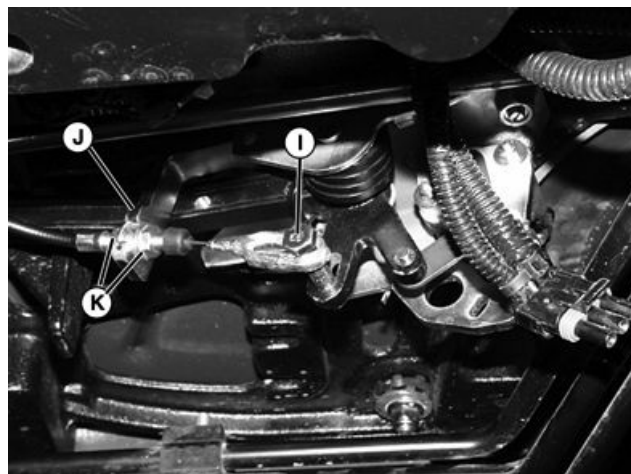
10. Install throttle cable to bracket (J). Install shoulder bolt (I) through slot in cable end.
11. Adjust nuts (K) on throttle cable so that when drive pedal is fully depressed, the throttle lever on injection pump is at full throttle position, and when pedal is released throttle lever returns all the way to idle position.
12. Connect wire harness to position sensor.
13. Install operator's platform and floor mat.
14. Calibrate position sensor to correct position. Tighten lock nuts to specification.

Specification

Lock Nut—Torque..... 3.4 N·m (30 lb.-in.)

I— Shoulder Bolt
J— Bracket

K—Nut (2 used)



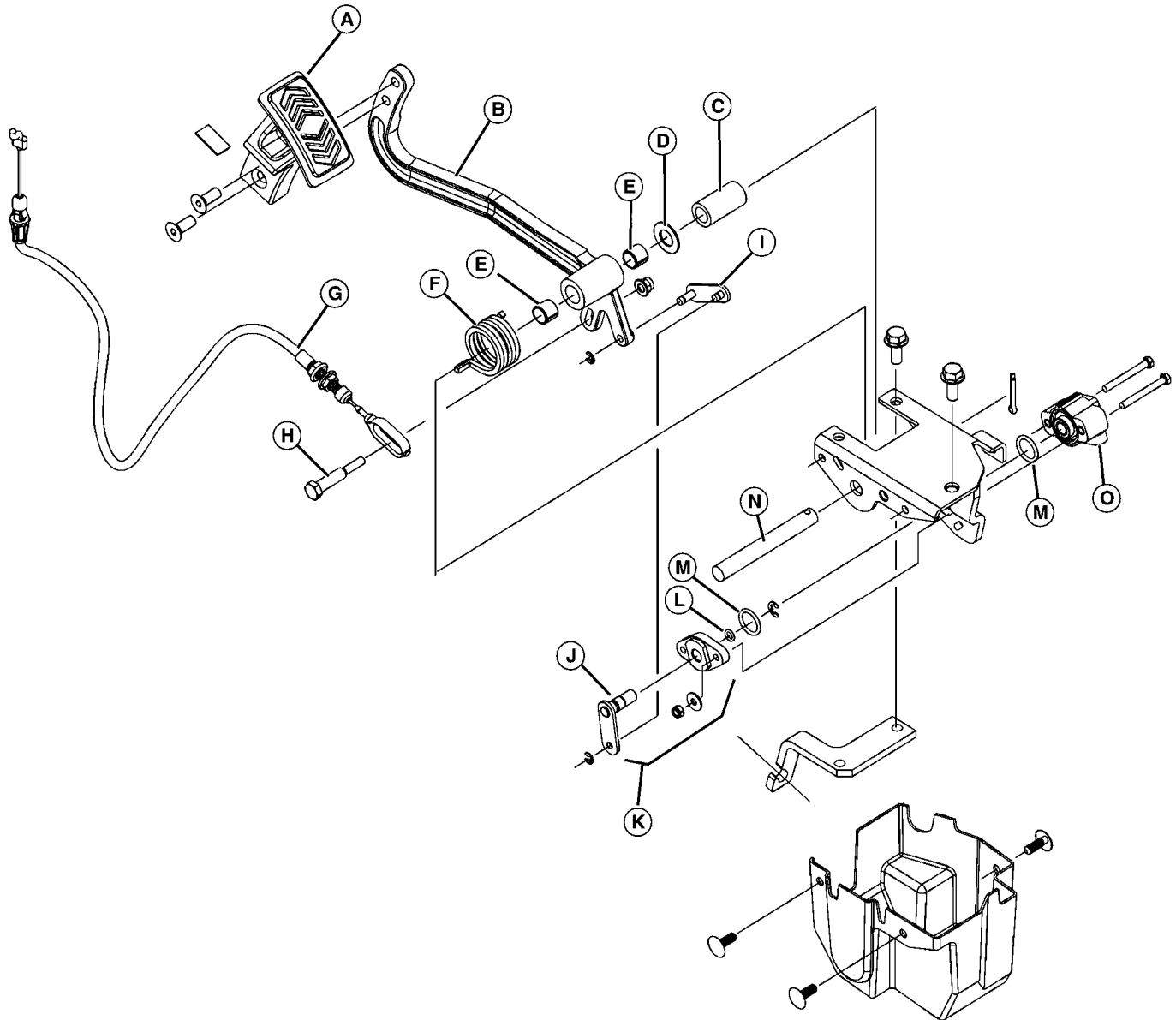
Throttle Cable

LVAL12241—UN—18NOV10

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SW03989,0000C52 -19-05NOV10-17/18

Drive Pedal Components—AutoHST



Drive Pedal Components

- | | | | |
|--------------------|---------------------------|-----------------------|-------------------|
| A—Pedal | F—Spring, Torsion | I—Link | N—Pedal Shaft |
| B—Drive Pedal Arm | G—Throttle Cable Assembly | J—Rotary Arm | O—Position Sensor |
| C—Spacer | H—Shoulder Bolt | K—Rotary Arm Assembly | |
| D—Washer | | L—O-ring | |
| E—Bushing (2 used) | | M—O-ring (2 used) | |

SW03989,0000C52 -19-05NOV10-18/18

LVAL12242 —UN—12NOV10

Machine Splitting (Front)

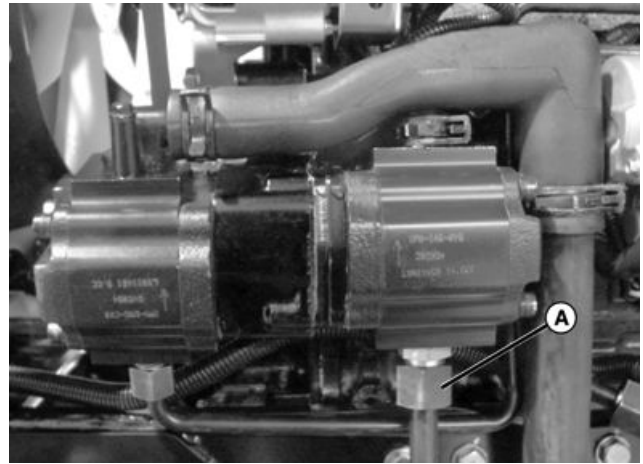
Prepare the Machine:

1. Park machine on a level surface. Engage park brake, shut off engine.
2. Disconnect battery negative cable and then battery positive cable.
3. Remove fuse panel cover.
4. Remove operator's platform. (See [Operator Platform Removal and Installation](#) in Section 120, Group 10.)
5. Locate and disconnect all electrical connectors attaching wiring harness to switches and lights on rear half of machine. Move harness away from rear half of machine.
6. Drain oil from transaxle.

Specification

Hydraulic
Reservoir—Capacity..... 25.7 liters (6.8 gal.)

7. Disconnect pressure line (A) from rear hydraulic pump on left side of engine.



Pressure Line

A—Pressure Line

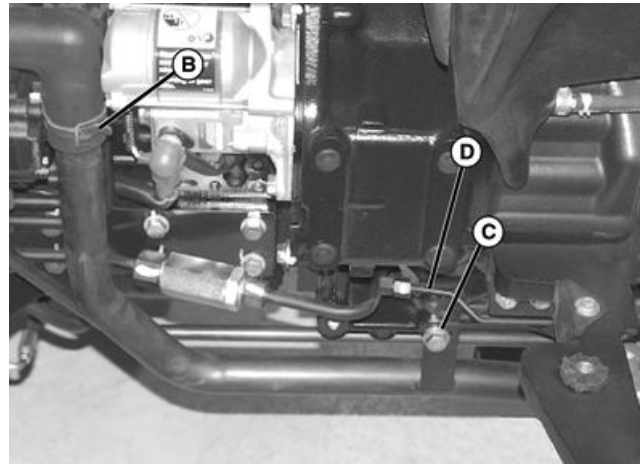
LVAL12243 —UN—18NOV10

SW03989,0000C53 -19-14FEB11-1/11

8. Remove hose clamp (B) and bolt (C) from suction line.
9. Remove PTO valve supply line (D).

B—Hose Clamp
C—Bolt

D—PTO Valve Supply Line



Hose Clamp

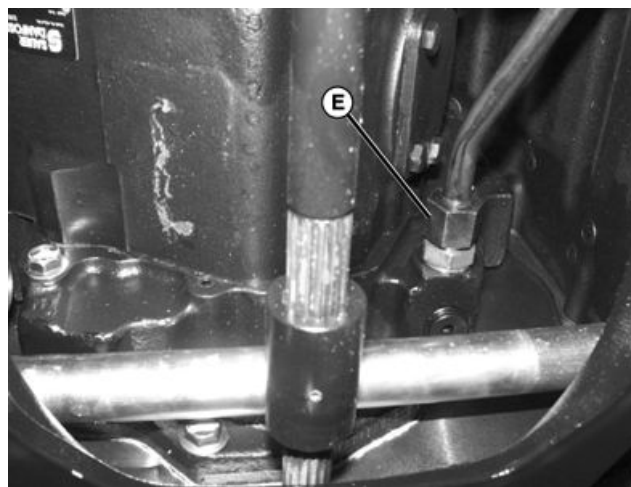
LVAL12244 —UN—18NOV10

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SW03989,0000C53 -19-14FEB11-2/11

10. Disconnect charge oil line (E) from transmission.

E—Charge Oil Line



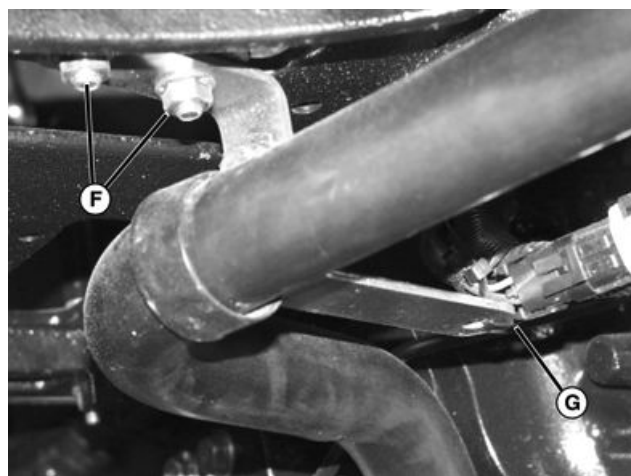
Charge Oil Line

SW03989,0000C53 -19-14FEB11-3/11

LVAL12245—UN—18NOV10

11. Remove cap screws and nuts (F) securing clamp to foot deck support. Cut wire tie (G).

F—Cap Screw (2 used) and Nut (2 used) G—Wire Tie



Foot Deck Support

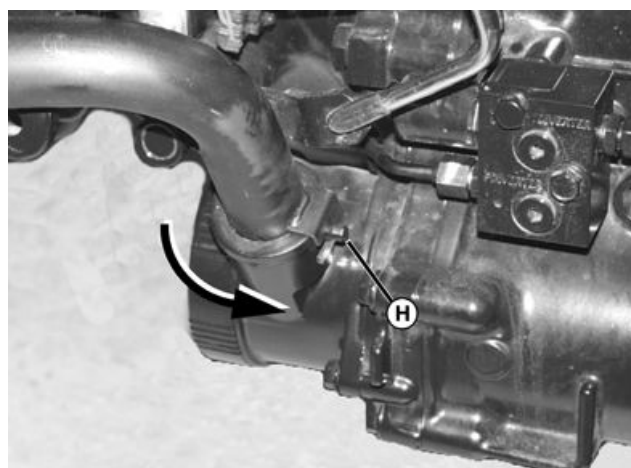
SW03989,0000C53 -19-14FEB11-4/11

LVAL12246—UN—18NOV10

NOTE: When the suction tube is disconnected and removed, there is approximately 0.95 L (1 qt.) of oil remaining in tube. Have a suitable container ready to catch oil.

12. Turn suction tube counterclockwise until latch is clear of pin (H) and pull tube out of filter housing. Allow suction tube to drain into an appropriate container.

H—Pin



Suction Tube

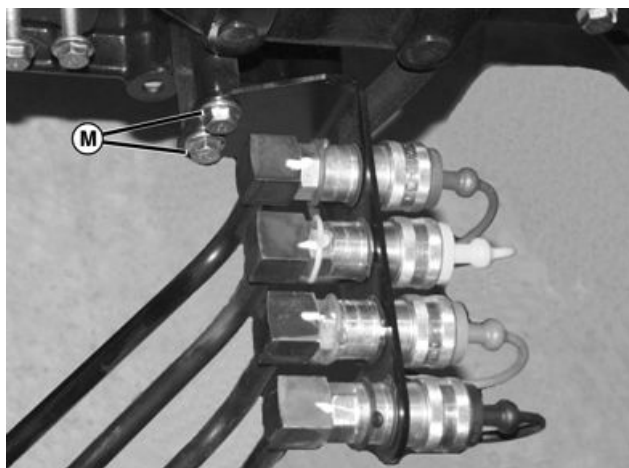
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SW03989,0000C53 -19-14FEB11-5/11

LVAL12247—UN—18NOV10

13. Remove two cap screws (M) securing SCV hydraulic lines bracket to frame.
14. Remove MFWD drive shaft and couplers as the machine is separated. Remove split pins from couplers when couplers are off for reassembly purposes.

M—Cap Screw (2 used)



Hydraulic Line Bracket

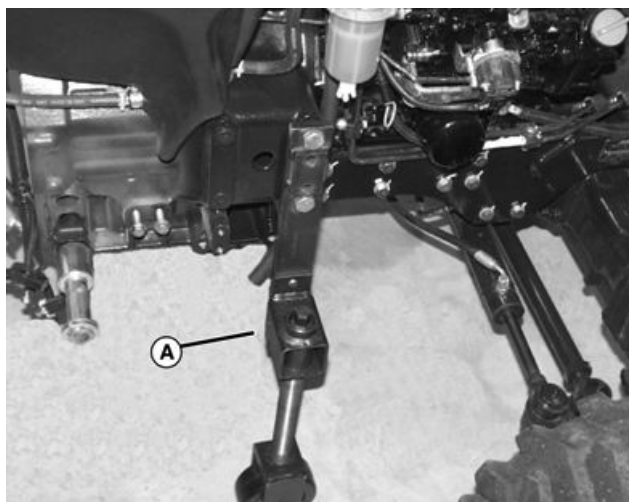
LVAL12248 —UN—18NOV10

SW03989,0000C53 -19-14FEB11-6/11

Split the Machine:

1. Using cap screws supplied with the splitting stands, secure JT07335 splitting stands (A) to the front holes in the clutch housing.
2. Support the transaxle tunnel.
3. Place range gear shift in NEUTRAL.

A—JT07335 Splitting Stand (2 used)



Splitting Stands

LVAL12249 —UN—18NOV10

Continued on next page

SW03989,0000C53 -19-14FEB11-7/11

IMPORTANT: Avoid Damage! Check for, and disconnect any additional accessory wires or hydraulic tubes connecting rear half to front half before splitting machine.

4. Remove cap screws (B) and lock washers attaching tunnel section to clutch housing. Note length and locations of cap screws when removing.
5. If necessary, use a small pry bar to separate the two machine sections. Split the machine by rolling the front sections away from the tunnel.

Assemble Machine Sections:

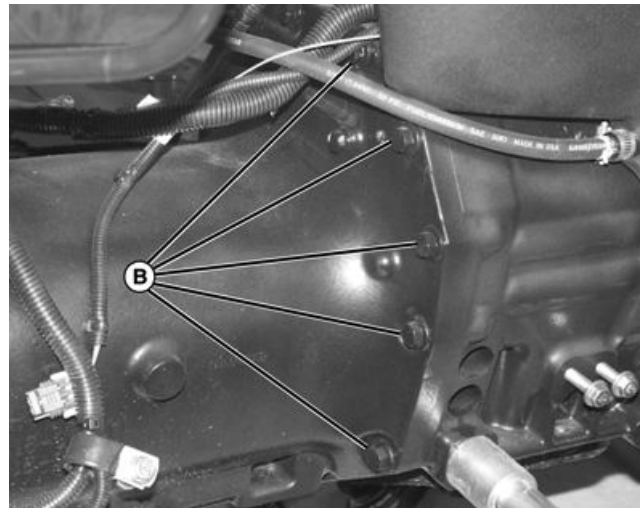
NOTE: The splines on the drive shafts and couplers must be aligned before machine sections are bolted together.

1. Align splines on drive shaft and engine flywheel.
2. Move machine sections together and retain with cap screws. Tighten cap screws to specification.

Specification

Cap Screw—Torque..... 126—154 N·m (95—115 lb.-ft.)

3. Remove splitting stands.
4. Install MFWD shaft and couplers.
5. Install line clamps securing steering lines to engine.



Note: Remove cap screws from both sides of the machine. One side is shown.

B—Cap Screw (10 used)

6. Tighten line nuts to specification.

Specification

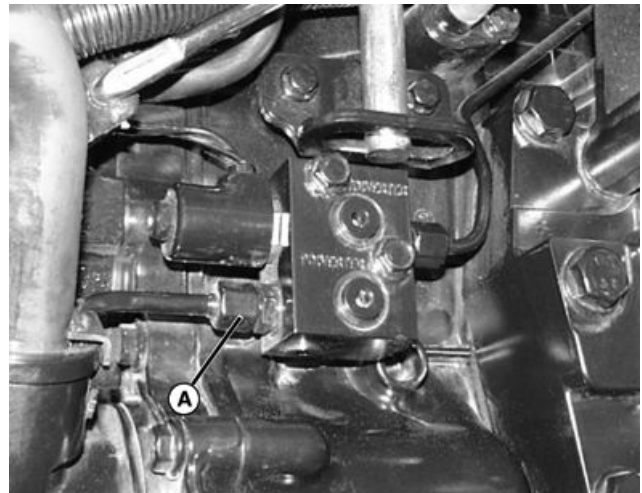
Line Nut—Torque..... 40—57 N·m (30—43 lb.-ft.)

LVAL12250 —UN—18NOV10

SW03989,0000C53 -19-14FEB11-8/11

7. Connect PTO pressure tube (A).
8. Install foot rest support brackets. Secure with five cap screws.
9. Connect suction line to suction filter assembly.
10. Install tube clamp securing suction line to footrest support bracket and secure with cap screws.
11. Install SCV hydraulics lines and support bracket as an assembly. Install two cap screws to attach tube support bracket to frame.

A—PTO Pressure Tube



PTO Pressure Tube

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SW03989,0000C53 -19-14FEB11-9/11

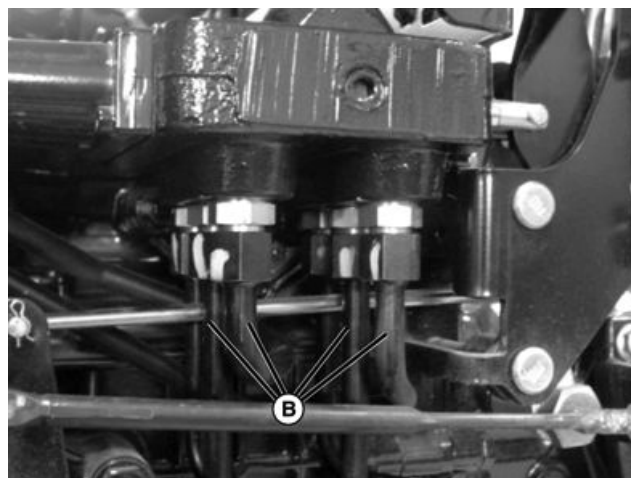
LVAL12251 —UN—18NOV10

12. Connect four work port tubes (B) to SCV. Tighten tube nuts to specification.

Specification

Tube Nut—Torque..... 40—57 N·m (30—43 lb.-ft.)

B—Work Port Tube (4 used)



Work Port Tube

LVAL12252 —UN—18NOV10

SW03989,0000C53 -19-14FEB11-10/11

13. Connect front of suction tube to suction manifold and retain with hose clamp (C).

14. Connect PTO pressure tube (D) to front hydraulic pump. Tighten fitting to specification.

Specification

Front Hydraulic Pump

Fitting—Torque..... 40—57 N·m (30—43 lb.-ft.)

15. Install operator's platform. (See [Operator Platform Removal and Installation](#) in Section 120, Group 10.)

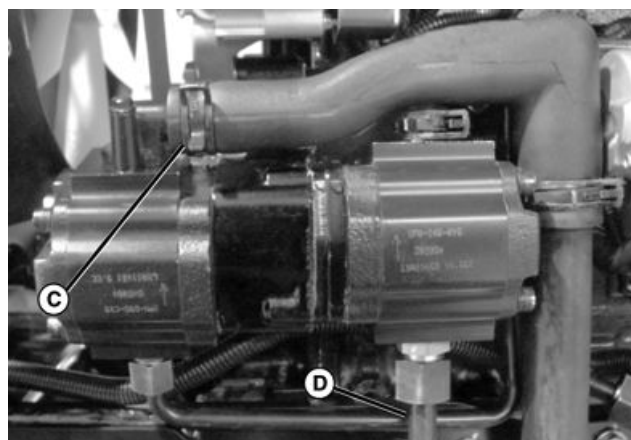
16. Install seat closeout. (See [Seat Closeout Removal and Installation](#) in Section 120, Group 10.)

17. Install floor mat.

18. Install fuse panel cover. (See [Fuse Panel Cover Removal and Installation](#) in Section 120, Group 10.)

19. Connect battery terminals, positive first then negative.

20. Bleed air from hydraulic system. (See [Hydraulic System Bleed Procedure](#) in Section 90, Group 30.)



Suction Manifold

C—Hose Clamp

D—PTO Pressure Tube

LVAL12253 —UN—18NOV10

SW03989,0000C53 -19-14FEB11-11/11

Machine Splitting (Rear)

Prepare the Machine:

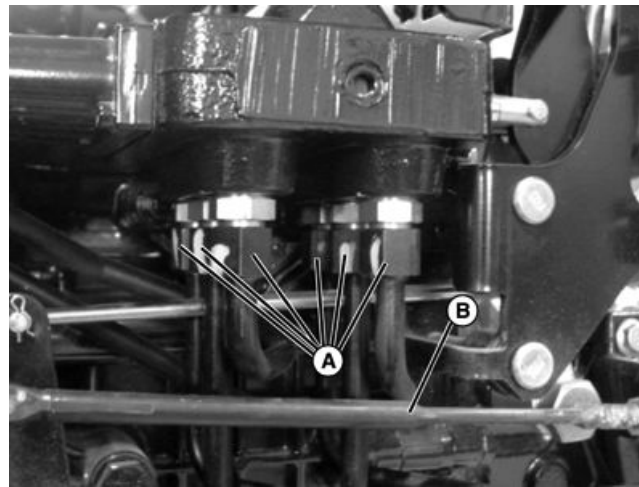
1. Park machine on a level surface. Shut off engine.
2. Disconnect battery negative terminal.
3. Remove floor mat.
4. Remove rear fenders. (See Rear Fenders Removal and Installation in Section 120, Group 10.)
5. Remove seat and seat support. (See Seat and Seat Support Removal and Installation in Section 120, Group 10.)
6. Remove seat closeout. (See Seat Closeout Removal and Installation in Section 120, Group 10.)
7. Remove operator's platform. (See Operator Platform Removal and Installation in Section 120, Group 10.)
8. Locate and disconnect all electrical connectors attaching the wiring harness to switches and lights on rear half of machine. Unfasten wiring harness from cable clips. Move harness away from rear section of machine.
9. Drain hydraulic oil reservoir.

Specification

Hydraulic Oil
Reservoir—Capacity..... 25.7 liters (6.8 gal.)

NOTE: Note or mark hydraulic fittings for assembly.

10. Disconnect SCV hydraulic lines (A) from SCV.



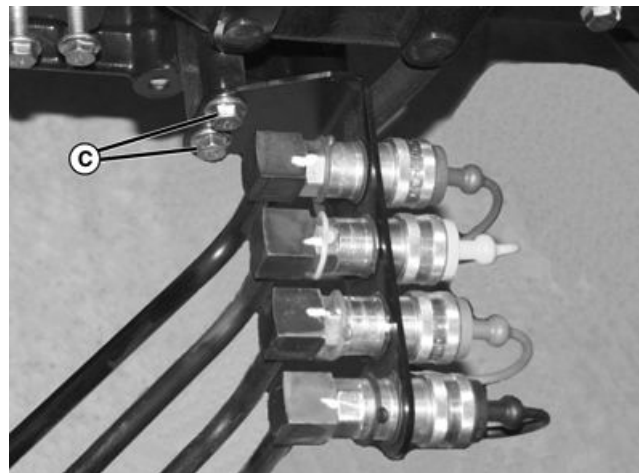
SCV Hydraulic Lines

A—SCV Hydraulic Line (6 used) B—Brake Rod

11. Remove brake rod (B).
12. Remove cap screws. Pull elbow away from transaxle case just enough to clear strainer. Pull elbow and tube out of filter base.
13. Disconnect hydraulic line.

14. Remove two cap screws (C) and spacers securing SCV hydraulic line bracket to the frame. Remove the hydraulic lines and bracket as an assembly.
15. Disconnect differential lock rod from pedal.
16. Disconnect all electrical connections. Disconnect brake rod.
17. Support tunnel and transmission sections. Remove six cap screws and four nuts.

C—Cap Screw (2 used)



SCV Hydraulic Line Bracket

Continued on next page

SW03989,0000C54 -19-14FEB11-2/8

LVAL12254—UN—18NOV10

LVAL12255—UN—18NOV10

NOTE: Support the drive shaft, split the machine and remove drive shaft as the machine is separated. Remove the split pin before assembly.

18. Remove MFWD drive shaft and couplers as the machine is separated. Remove split pins (D) from couplers when couplers are off for reassembly purposes.

Split the Machine:

IMPORTANT: Avoid Damage! Check for, and disconnect any additional accessory wires or hydraulic tubes connecting rear half to front half before splitting machine.

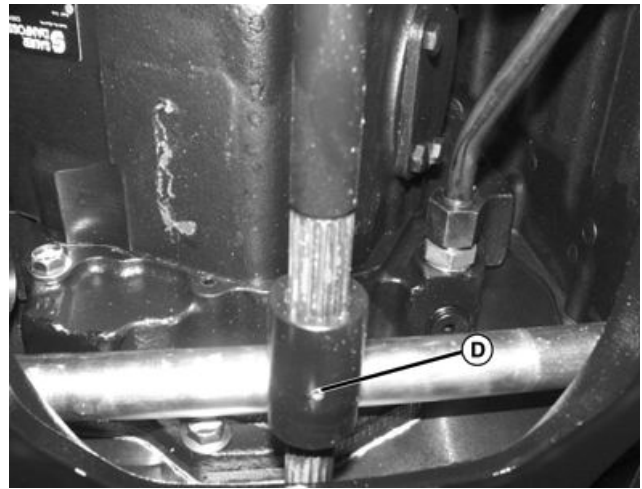
1. Using suitable stands, support the front and rear of the differential housing.
2. If necessary, use a pry bar to separate the two machine sections. Split the machine by rolling the front section of the machine away from the differential housing.

Assemble Machine Sections:

IMPORTANT: Avoid Damage! Be sure PTO collar is in place on shaft or in end of PTO clutch before assembling machine sections. Smaller end of collar goes toward PTO clutch.

IMPORTANT: Avoid Damage! Splines on all drive shafts and couplers must be aligned before machine sections are bolted together.

1. Clean tunnel section mating surfaces and install a new gasket.



Split Pin Removal

D—Split Pin (2 used)

2. Align splines on drive shafts and couplers.
3. Move machine sections together and retain with nuts, lock washers, and cap screws. Tighten nuts and cap screws to specification.

Specification

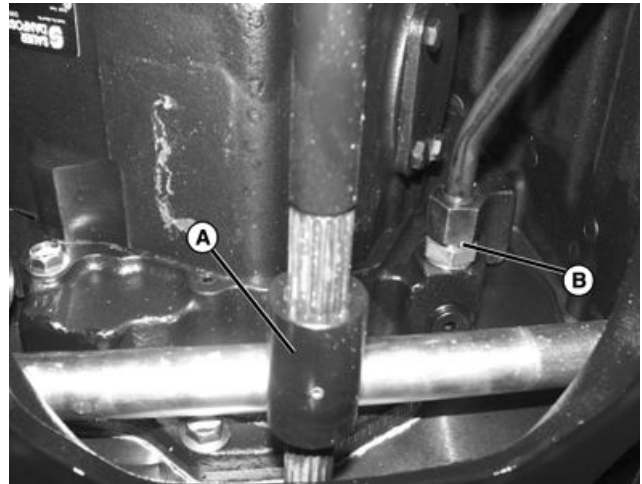
Machine Section	
Retaining Nut and Cap	
Screw—Torque.....	80—98 N·m (59—72 lb.-ft.)

4. Remove splitting stands.

SW03989,0000C54 -19-14FEB11-3/8

5. Install hydraulic line (B). Install MFWD shaft and couplers (A).

A—MFWD Shaft and Couplers B—Hydraulic Line



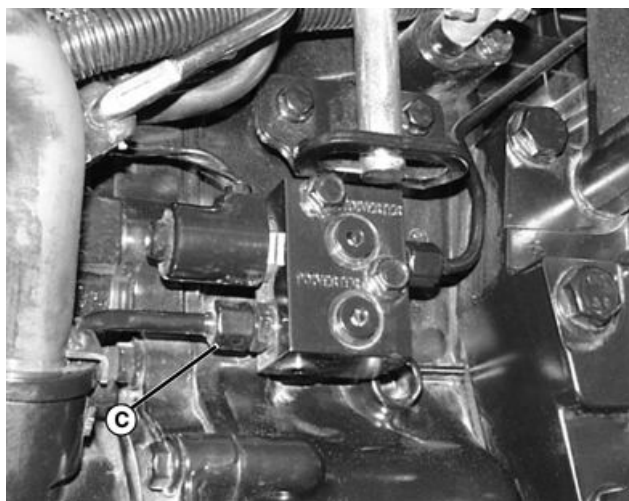
Hydraulic Line

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SW03989,0000C54 -19-14FEB11-4/8

6. Connect hydraulic line (C) to PTO valve.

C—Hydraulic Line



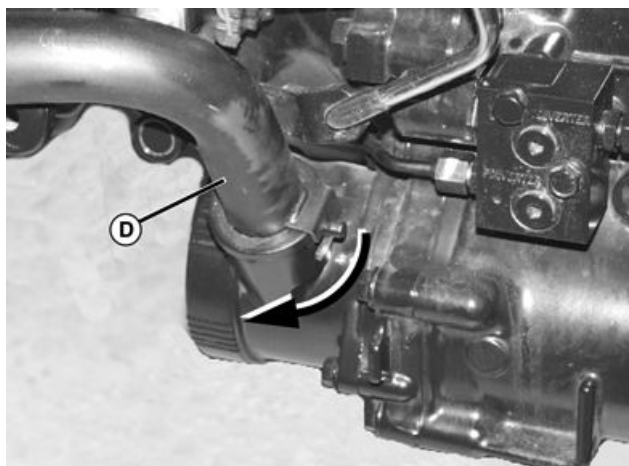
PTO Valve Hydraulic Line

LVAL12258—UN—18NOV10

SW03989,0000C54 -19-14FEB11-5/8

7. Install suction tube (D). Turn suction tube clockwise.

D—Suction Tube



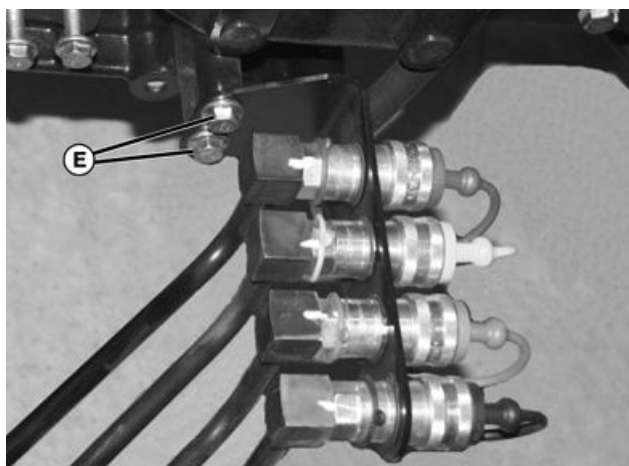
Suction Tube

LVAL12259—UN—18NOV10

SW03989,0000C54 -19-14FEB11-6/8

8. Install SCV tube support bracket and tubes as an assembly. Install two cap screws (E) and two spacers to attach tube support bracket to frame.

E—Cap Screw (2 used)



SCV Tube Support Bracket

LVAL12260—UN—18NOV10

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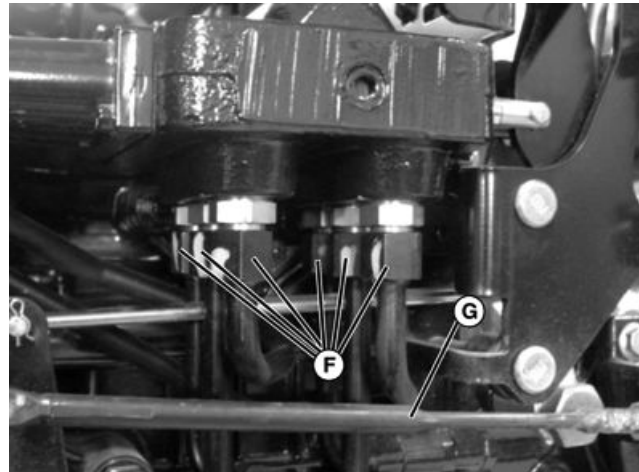
SW03989,0000C54 -19-14FEB11-7/8

9. Connect work port tubes (F) to SCV. Tighten to specification.

Specification

Work Port tube—Torque..... 40—57 N·m (30—43 lb.-ft.)

10. Install brake rods (G).
11. Route electrical harness on rear half of machine. Connect all electrical connectors attaching wiring harness to switches and lights on rear half of machine. Fasten wiring harness to cable clips. Replace plastic tie wraps removed during disassembly.
12. Install operator's platform. (See Operator Platform Removal and Installation in Section 120, Group 10.)
13. Install seat closeout panel. (See Seat Closeout Removal and Installation in Section 120, Group 10.)
14. Install seat and seat support. (See Seat and Seat Support Removal and Installation in Section 120, Group 10.)
15. Install rear fenders. (See Rear Fenders Removal and Installation in Section 120, Group 10.)
16. Install floor mat.
17. Connect battery negative terminal.



Work Port Tube

F—Work Port Tubes (6 used) G—Brake Rod

18. Bleed air from hydraulic system. (See Hydraulic System Bleed Procedure in Section 90, Group 30.)

LVAL12261—UN—18NOV10

SW03989,0000C54 -19-14FEB11-8/8

Hydrostatic Transmission Removal and Installation

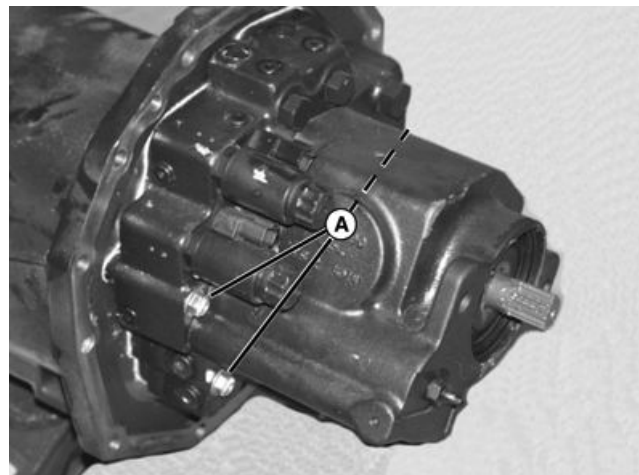
Special or Essential Tools:

- JDG1239—Guide Rods

Removal:

1. Park machine on level surface. Stop engine. Release hydraulic pressure by operating all controls.
2. Split front of machine. (See Machine Splitting (Front) in Section 70, Group 40.)
3. Remove three of the cap screws (A) that fasten the transmission unit to the tunnel. Replace with JDG1239 Guide Rods.

A—Cap Screw (3 used)



Transmission-to-tunnel Retaining Cap Screws

LVAL12262—UN—18NOV10

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SW03989,0000C55 -19-11NOV10-1/3

NOTE: Oil may drain from the pump and motor unit after it is removed. Have a suitable container available to catch excess oil.

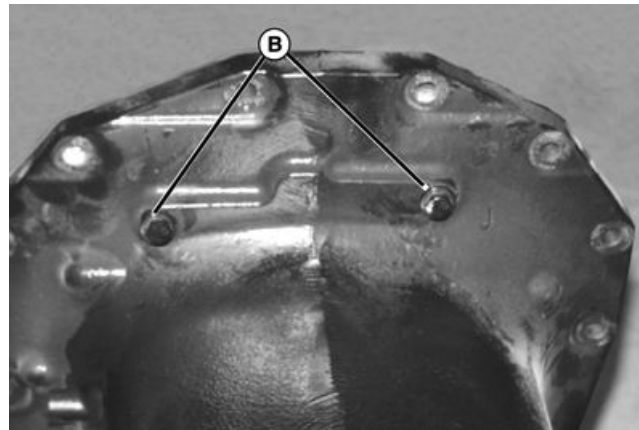
4. Remove two cap screws (B) from the back side of the tunnel flange.

CAUTION: Avoid Injury! Hydrostatic unit weighs approximately 50 kg (110 lb.). Use a suitable lifting device, or obtain assistance when removing unit from tunnel.

5. Slide the transmission forward and out of the tunnel on the guide rods.
6. When the pump is clear of the tunnel, lift and remove from machine.

Specification

Hydrostatic
Pump—Weight.....50 kg (110 lb.)



Tunnel Flange Cap Screws

B—Cap Screw (2 used)

LVAL12263—UN—18NOV10

SW03989,0000C55 -19-11NOV10-2/3

7. Check if splined collar (C), drive shaft (D), PTO collar (E), and shaft (F) remained in place or fell into bottom of tunnel. Return parts to original positions as shown before reassembly.

Installation:

Installation is the reverse of removal.

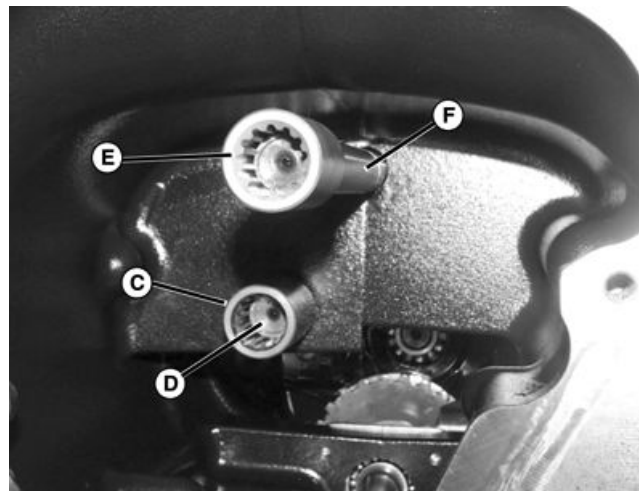
- Remove guide rods.
- Clean flanges of transmission and tunnel before applying sealant.
- Apply TY16021 sealant to flanges of transmission where it contacts the tunnel.
- Make sure the PTO shaft and collar, and the drive collar and shaft are in place in tunnel.
- Install JDG1239 guide rods.

IMPORTANT: Avoid Damage! If replacing transmission, be sure to remove plastic shipping caps before installation.

- Install transmission.
- Tighten cap screws attaching transmission to tunnel to specification.

Transmission To Tunnel Specifications:—Specification

Transmission to Tunnel
Mounting Screws
M10—Torque..... 52—68 N·m (38—50 lb.-ft.)
SCV Pressure Tube to
Pump—Torque..... 55—79 N·m (40—59 lb.-ft.)
SCV Pressure Tube to
SCV—Torque..... 55—79 N·m (40—59 lb.-ft.)



Splined Collar

C—Splined Collar
D—Drive Shaft

E—PTO Collar
F—Shaft

SCV Work Port Tubes to
SCV—Torque..... 40—57 N·m (30—43 lb.-ft.)
Charge Pressure
Tube to Transmission
Adapter—Torque..... 55—79 N·m (40—59 lb.-ft.)
Tunnel to Clutch Housing
Cap Screw—Torque..... 126—154 N·m (95—115 lb.-ft.)

SW03989,0000C55 -19-11NOV10-3/3

LVAL12264—UN—18NOV10

Hydrostatic Transmission Disassembly

Disassembly:

The only components that can be serviced on the hydrostatic unit are:

- Proportioning valves and coils
- System relief valves
- Charge pressure relief valve
- Input shaft seal

Internal components of the transmission are not serviceable. Remanufactured transmissions are available as complete units.

If the proportional solenoid valves are removed or replaced, tighten valve body and solenoid nut to specification.

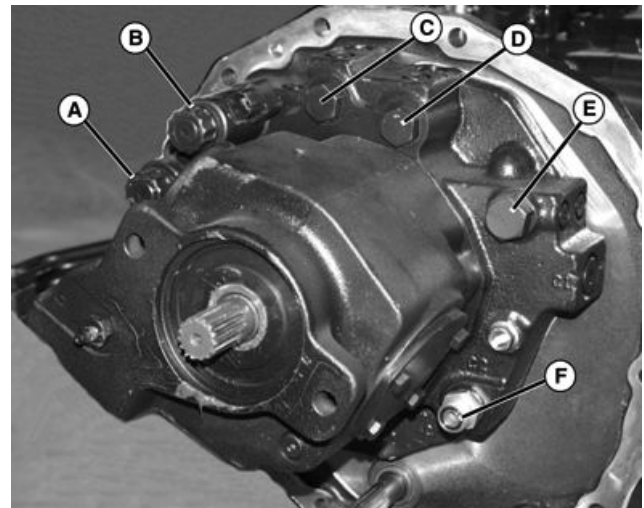
Valve Body and Solenoid Torque—Specification

Proportional Valve

Body—Torque..... 13—19 N·m (10—14 lb.-ft.)

Solenoid Nut—Torque..... 3—5 N·m (24—48 lb.-in.)

Valve Locations:



Valve Locations

A—Reverse Proportioning Coil and Valve

B—Forward Proportioning Coil and Valve

C—Forward SCR Valve Cap

D—Reverse SCR Valve Cap

E—Charge Pressure Relief Valve Cap

F—Charge Pressure Inlet Adapter

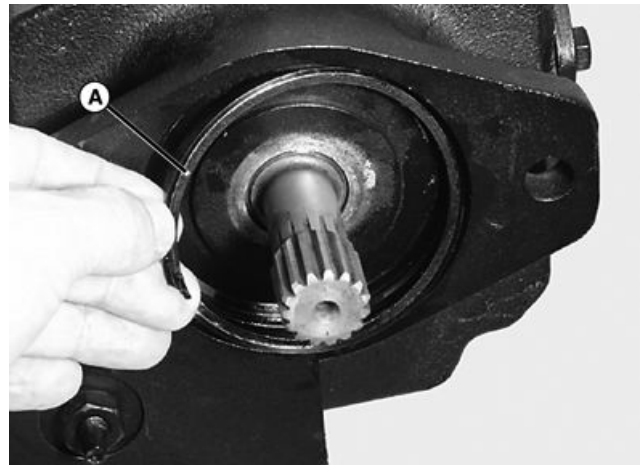
LVAL12265—UN—18NOV10

SW03989,0000C56 -19-05NOV10-1/3

Front Seal Replacement:

1. Place transmission in a clean work area.
2. Remove spiral retaining ring (A), that holds the seal plate, from the groove in transaxle.
3. Use a soft mallet. Tap the opposite end of the input shaft to drive the input shaft and seal plate out enough to remove the seal plate.
4. Remove O-ring.
5. Remove shaft seal from seal plate.

A—Spiral Retaining Ring



Spiral Retaining Ring

LVAL12266—UN—18NOV10

Continued on next page

SW03989,0000C56 -19-05NOV10-2/3

6. Install new seal (B) into seal plate. Install O-ring (C) to plate.
7. Lubricate seal and O-ring with new hydraulic oil.
8. Clean and lubricate input shaft and internal surface of transmission.

NOTE: Tap seal plate with large deep well socket or press ring to seat spiral retaining ring in groove.

9. Install seal assembly to transmission. Secure with spiral retaining ring.

B—Seal

C—O-ring



Seal Plate

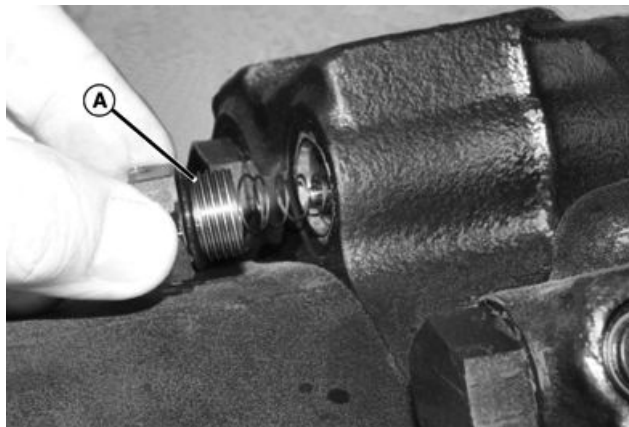
LVAL12267—UN—18NOV10

SW03989,0000C56 -19-05NOV10-3/3

System Check/Relief Valve Inspection/Replacement

1. Remove SCR valve cap (A).

A—SCR Valve Cap



SCR Valve Cap

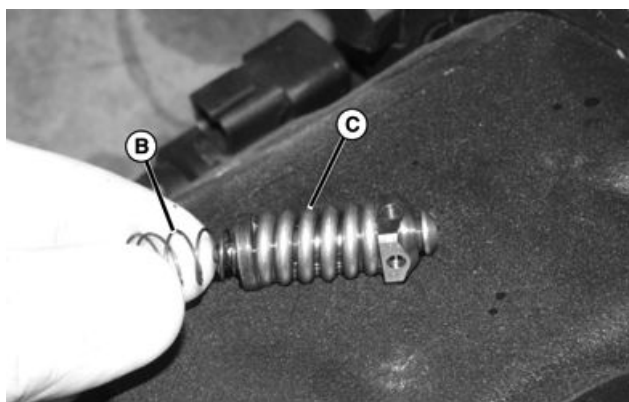
LVAL12268—UN—18NOV10

SW03989,0000C57 -19-05NOV10-1/3

2. Remove SCR relief valve. Inspect check valve spring (B) and relief spring (C).

B—Valve Spring

C—Relief Spring



SCR Relief Valve

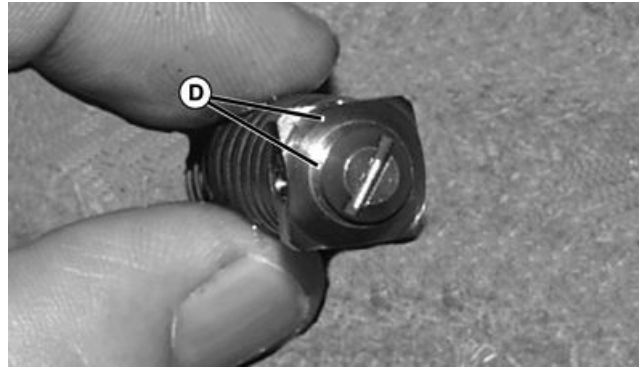
LVAL12269—UN—18NOV10

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SW03989,0000C57 -19-05NOV10-2/3

3. Inspect seat areas (D) for nicks, burrs or foreign material. If any parts are suspect, replace valve assembly.
4. Replace O-ring on valve cap when installing.

D—Seat Area (2 used)



Valve Assembly

LVAL12270 —UN—18NOV10

SW03989,0000C57 -19-05NOV10-3/3

Section 80 Power Train—Final Drive

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General Specifications

Item	Measurement	Specification
Transaxle:		
Oil	Type	John Deere J20C
Item	Measurement	Specification
Hydraulic Reservoir:		
PRT Machine Hydraulic Reservoir	Capacity	23.8 L (6.3 gal.)
Machine Hydraulic Reservoir eHydro™	Capacity	25.7 L (6.8 gal.)
Item	Measurement	Specification
PTO Speeds (At Rated Engine rpm)		
Rear PTO	Speed	540 rpm
Mid PTO	Speed	2100 rpm
Item	Measurement	Specification
MFWD:		
Oil	Type	John Deere J20D
Oil	Capacity	5.0 L (1.3 gal.) (5.3 qt.)

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Repair Specifications

Item	Measurement	Specification
PTO Clutch/Brake Specifications:		
Clutch/Brake Plate (End Plate)	Thickness	3.18 mm (0.125 in.)
Minimum Clutch/Brake Plate (Friction Plates)	Thickness	1.4 mm (0.055 in.)
Clutch/Brake Plates (Steel)	Thickness	2.3 mm (0.091 in.)
Interlock Pin	Length	19.5 mm (0.768 in.)
Pinion and Ring Gear Specifications:		
Differential Ring Gear	Backlash	0.1—0.2 mm (0.004—0.008 in.)
Front Wheel Alignment:		
Toe In Measurement	Distance	0—3 mm (0.0—0.12 in.)
Inclination	Angle	13°
Swing	Angle	10°
Steering Angle:		
Inward	Angle	54°
Outward	Angle	62°

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Torque Specifications

Item	Measurement	Specification
Torque Specifications:		
PTO Cover Cap Screws	Torque	28 N·m (20 lb.-ft.)
Final Drive to Transmission Housing Cap Screws	Torque	145 N·m (107 lb.-ft.)
Plug (w/ TEFLON® tape)	Torque	34.8—41.7 N·m (26—30 lb.-ft.)
Ring Gear Cap Screws	Torque	78 N·m (58 lb.-ft.)
Differential Bearing and Shim Carrier	Torque	28 N·m (21 lb.-ft.)
Rear Wheel Bolts	Torque	140 N·m (103 lb.-ft.)
M8 (7T) Cap Screws	Torque	23—29 N·m (17—21 lb.-ft.)
M10 (7T) Cap Screws	Torque	44—59 N·m (33—43 lb.-ft.)
M12 (7T) Cap Screws	Torque	79—98 N·m (58—72 lb.-ft.)
Eccentric Lock Nut (Lower and Upper)	Torque	78—98 N·m (58—72 lb.-ft.)
PTO Valve Pipe End	Torque	25 N·m (18 lb.-ft.)
Transmission Housing Port Plugs	Torque	26 N·m (19 lb.-ft.)

Item	Measurement	Specification
Front Axle MFWD:		
Front Wheel Bolts	Torque	140 N·m (103 lb.-ft.)
Final Drive Cover Cap Screw	Torque	30—38 N·m (22—28 lb.-ft.)
Differential Carrier Housing to MFWD Housing Cap Screw	Torque (with thread locking compound)	102—108 N·m (75—80 lb.-ft.)
Tie Rod Nut	Torque	115—129 N·m (85—95 lb.-ft.)
Differential Ring Gear Cap Screws	Torque	79—88 N·m (58—65 lb.-ft.)
Differential Bearing Retainer Cap Screws	Torque	54—68 N·m (40—50 lb.-ft.)
Pinion Retaining Nut	Torque	258—285 N·m (190—210 lb.-ft.)
MFWD Housing to Spindle Housing Cap Screw	Torque (with thread locking compound)	286—316 N·m (211—233 lb.-ft.)

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SW03989,0000C5A -19-05NOV10-1/1

Essential or Recommended Tools

NOTE: Order tools from the *SERVICEGARD™* Catalog.

ESSENTIAL TOOLS listed are required to perform the job correctly and are obtainable only from the *SERVICEGARD™* Catalog.

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RECOMMENDED TOOLS, as noted, are suggested to perform the job correctly. Some tools may be available from local suppliers or may be fabricated.

Continued on next page

SW03989,0000C5B -19-05NOV10-1/6

Specifications

Clutch Spring CompressorJDG 1169 To compress spring on clutch packs.

SW03989,0000C5B -19-05NOV10-2/6

Splitting Stands and Brackets.....JTO 7335-1,2,3 Used for splitting machine.

SW03989,0000C5B -19-05NOV10-3/6

Pinion Depth and Backlash set up.....JDG 1395A Used to calculate MFWD pinion depth if carrier housing is replaced.

SW03989,0000C5B -19-05NOV10-4/6

Transaxle Pinion Depth Gauge JDG 2023 Used to calculate shim thickness for proper pinion depth.

SW03989,0000C5B -19-05NOV10-5/6

Differential Lock Spring Compressor..... JDG 2025 Compress spring on differential lock shaft for retaining ring removal/installation.

SW03989,0000C5B -19-05NOV10-6/6

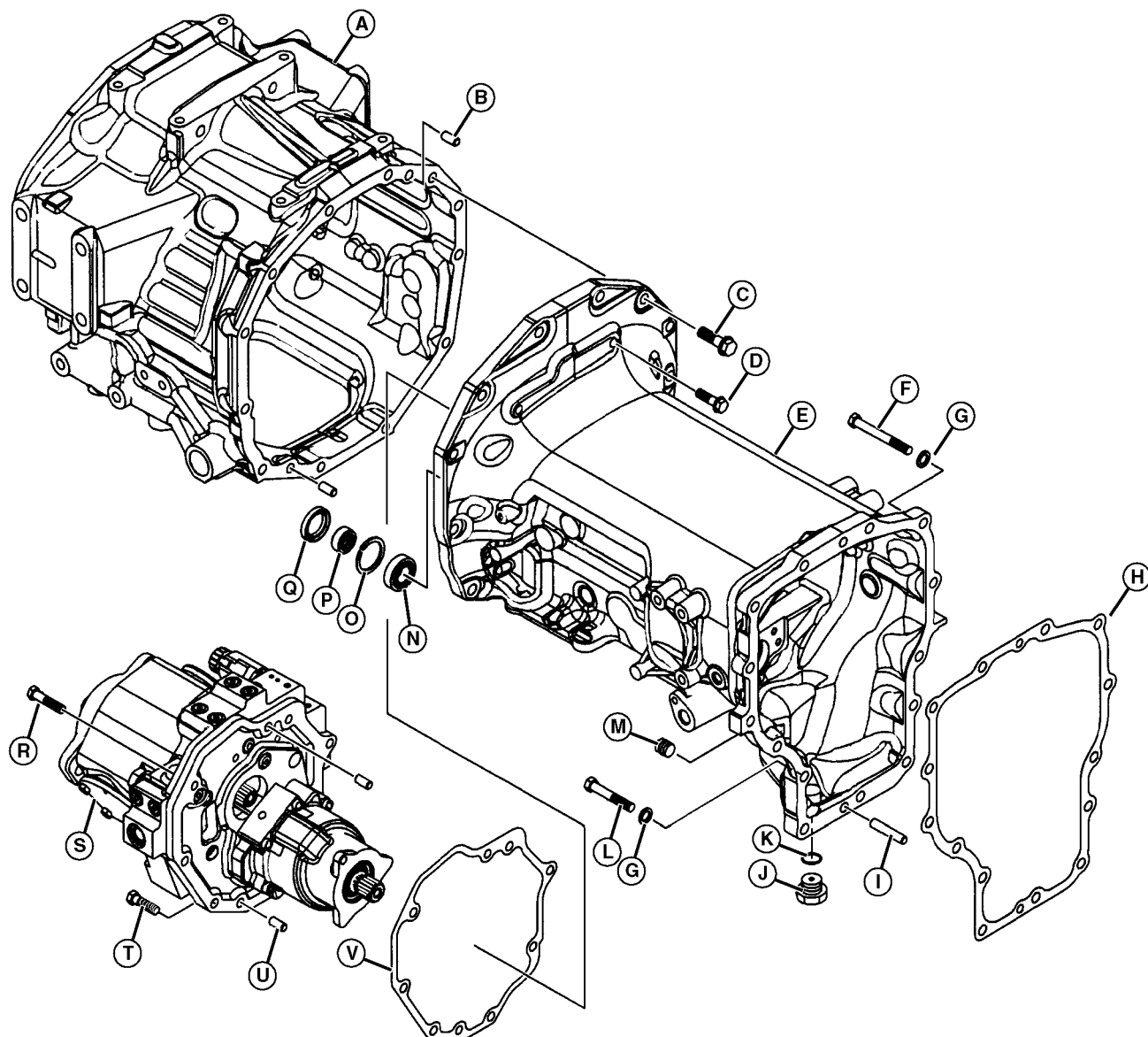
Other Material

Number	Name	Use
PM37509 (U.S.)	John Deere Clean and Cure Primer	Clean mating surfaces; helps speed curing.
PM37465 Canada PM38616 587 (U.S.®)	RTV Silicone Form-in-Place Gasket	Seals transaxle and final drive case halves.
TY6333 (U.S.)	Moly High Temperature EP Grease	To lubricate synchronizers.
PM37418/PM37477 242 (U.S.®)	Thread Lock and Sealer (Medium Strength)	On dowel pins and certain cap screws.
PM38655 Canada PM38625 515 (U.S.®)	Flexible Form-In-Place Gasket	Seals the front axle final drive cover to the final drive housing. Also applied to the outer surface of the wheel seals.
PM37421/PM38654 271 (U.S.®)	Thread Lock and Sealer (High Strength)	Apply to front axle spindle housing cap screws and to the MFWD housing cap screws.
PM38652 620 (U.S.®)	Loctite Retaining Compound (High Temperature)	Seals front axle final drive housing cap.
PM38655 Canada PM38625 515 (U.S.®)	Flexible Form-In-Place Gasket	Sealing flange assemblies.
TY15934 (U.S.)	John Deere General Purpose Gasket Dressing	Sealing gaskets and hoses.

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MM61211,00000CA -19-12NOV10-1/1

Transmission (eHydro™)



A—Clutch Housing
B—Alignment Pin (2 used)
C—Bolt (12 used)
D—Bolt (2 used)
E—Transmission Housing

F—Bolt (12 used)
G—Washer (14 used)
H—Gasket
I—Alignment Pin (2 used)
J—Plug
K—O-ring

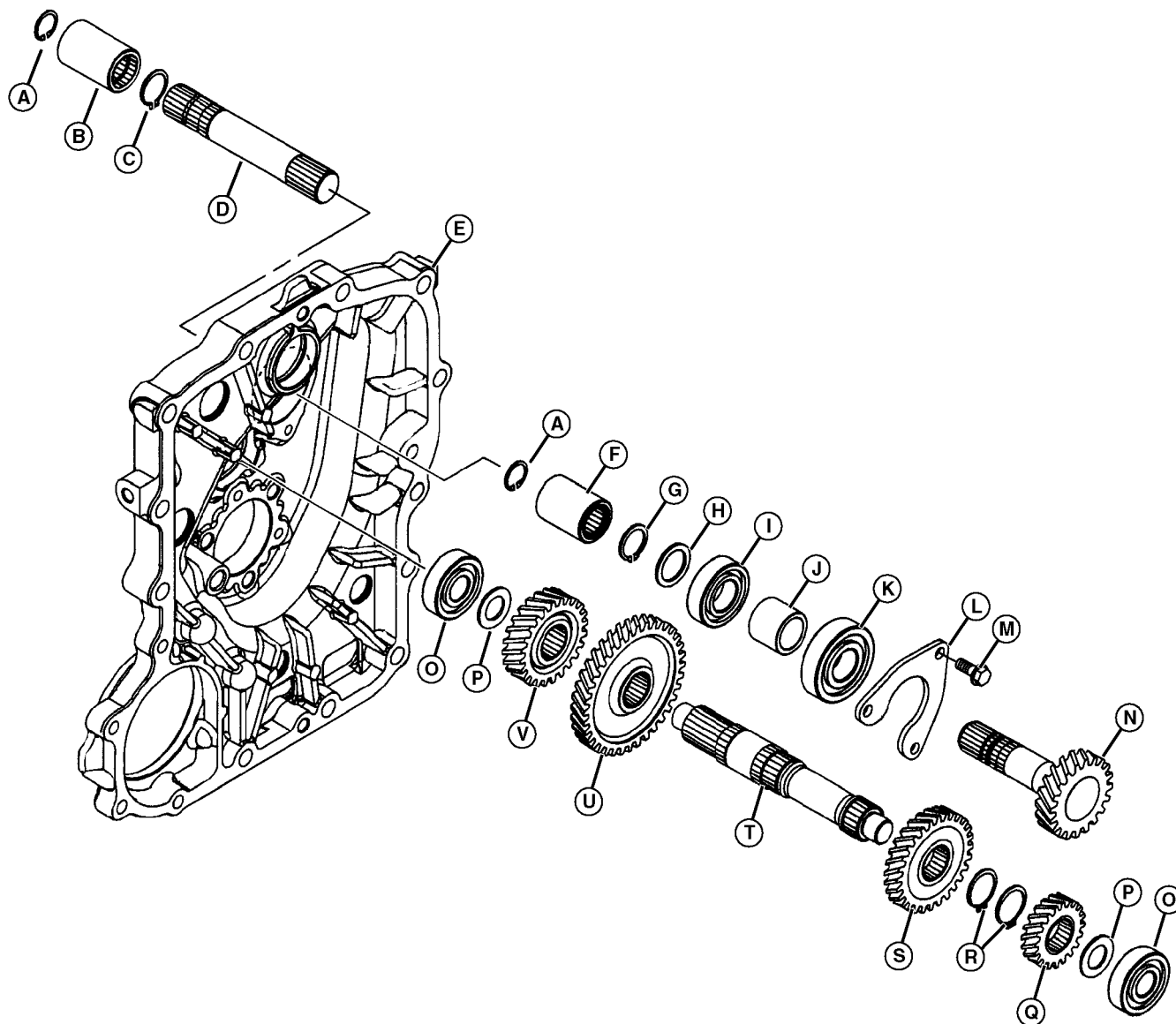
L—Bolt
M—Plug (1/2 NPT)
N—Bearing
O—Circlip
P—Sleeve, 20x30x13
Q—Oil Seal
R—Bolt (3 used)

S—Transmission
T—Bolt (2 used)
U—Alignment Pin (2 used)
V—Gasket

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SW03989,0000C5D -19-05NOV10-1/1

Main and Driven Shafts (eHydro™)



A—Circlip (2 used)
 B—Coupling (To Transmission)
 C—Snap Ring
 D—Main Drive Shaft
 E—Center Plate
 F—Coupling (to Main Gear)

G—Circlip
 H—Washer, 25x34x2
 I—Bearing
 J—Spacer, 25x34x29.2
 K—Bearing
 L—Bearing Retainer
 M—Bolt (3 used)

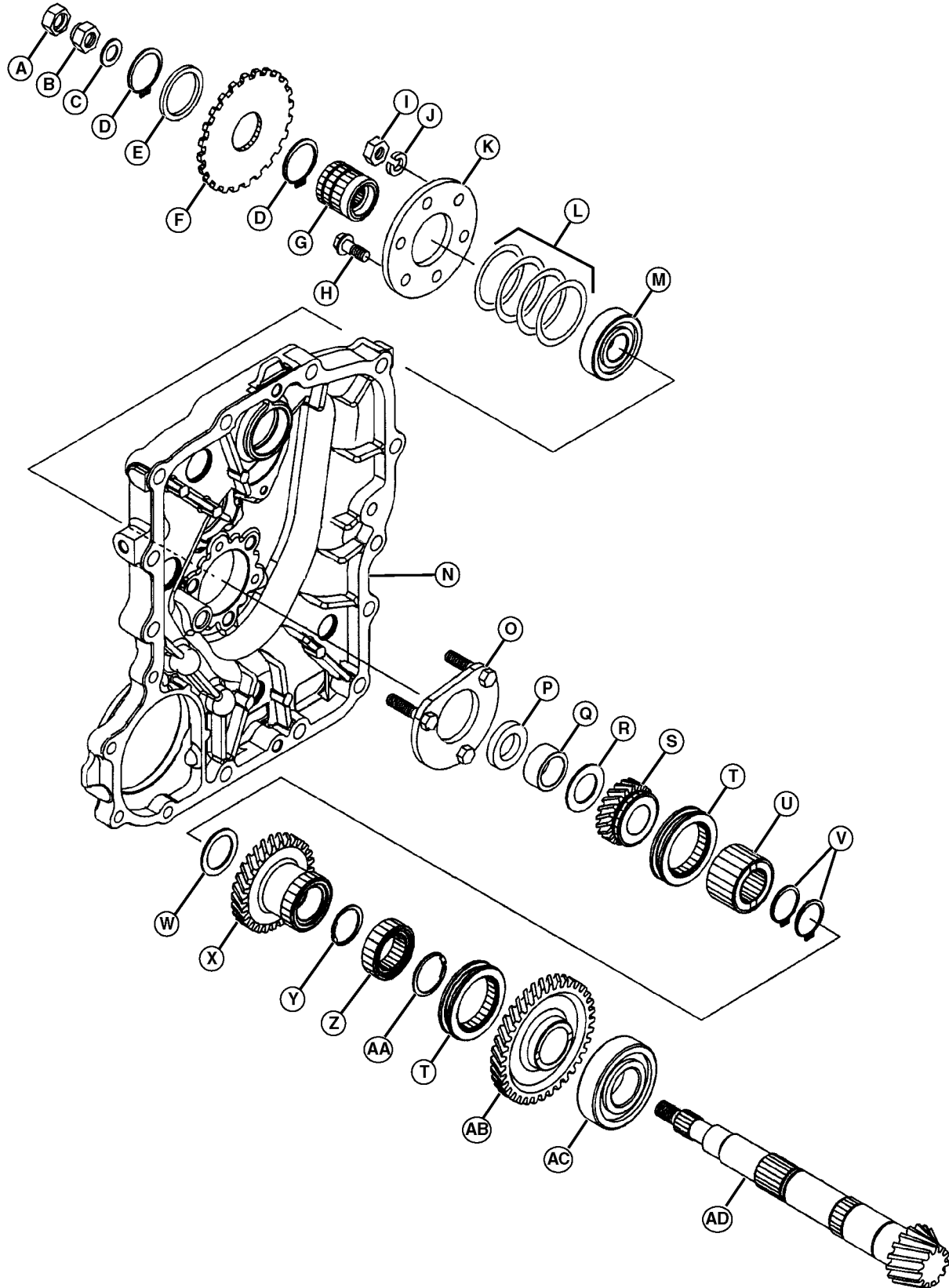
N—Main Gear, 20T
 O—Bearing (2 used)
 P—Washer, 20x34x2 (2 used)
 Q—Range Gear, 20T
 R—Snap Ring (2 used)

S—Range Gear, 26T
 T—Driven Shaft
 U—Range Gear, 41T
 V—Driven Gear, 24T

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SW03989,0000C5E -19-05NOV10-1/1

Drive/Pinion Shaft (eHydro™)



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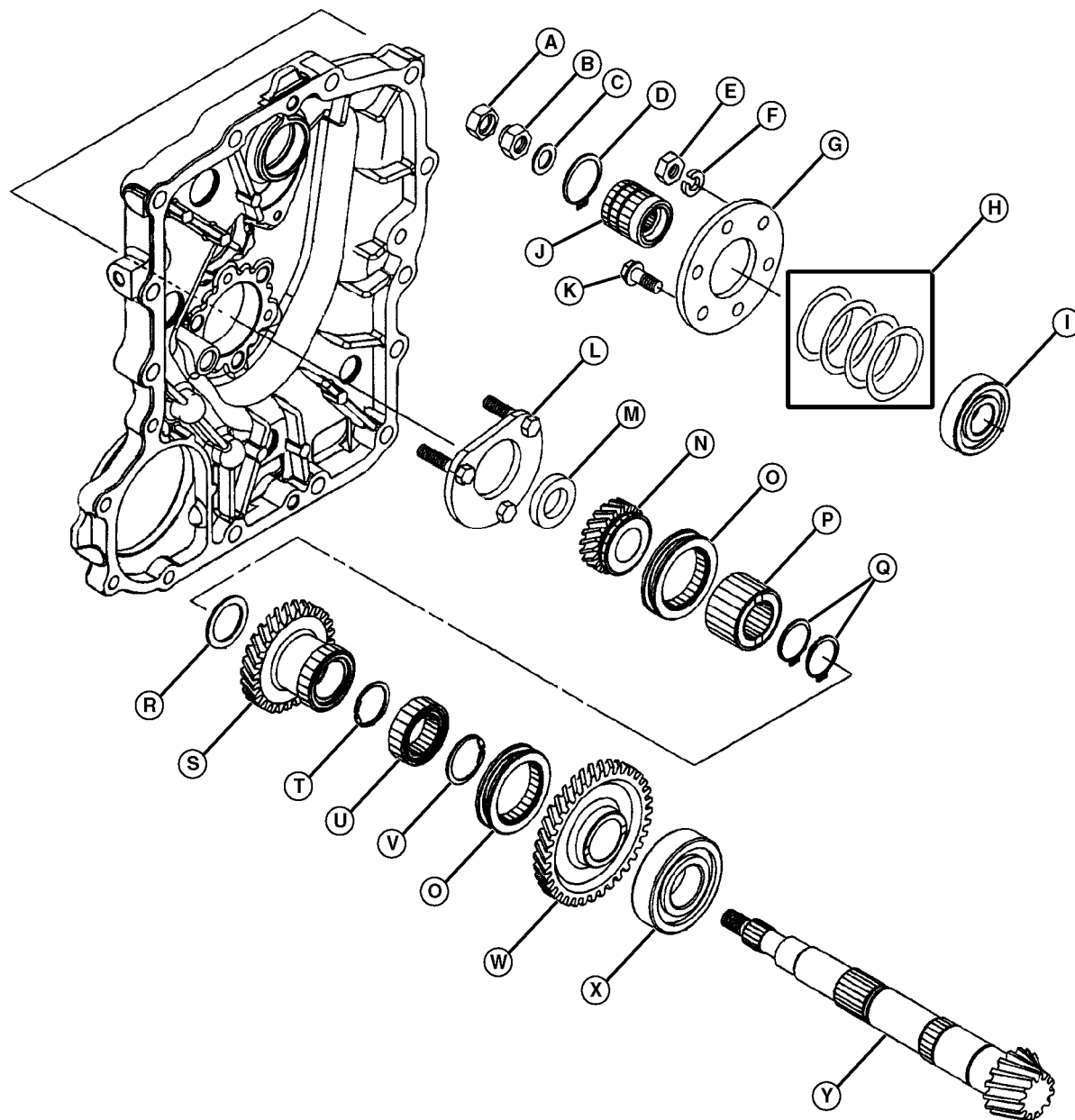
Component Location

A—Nut, Upper	I— Nut (3 used)	Q—Collar	Y—Circlip
B—Nut, Lower	J— Lock Washer (3 used)	R—Washer, 28x45x2	Z— Spline Collar
C—Spacer, 15X25X2	K—Retainer Plate	S—Counter Gear, 20T	AA—Circlip
D—Snap Ring (2 used)	L—Shim Kit	T—Shift Collar (2 used)	AB—Counter Gear, 44T
E—Collar	M—Bearing	U—Spline Collar	AC—Bearing
F—Speed Sensing Gear	N—Center Plate	V—Snap Ring (2 used)	AD—Pinion Shaft
G—Spline Collar (MFWD)	O—Bearing Retainer Assembly	W—Washer, 32x44x2	
H—Bolt, M10x25 (3 used)	P—Washer	X—Counter Gear, 29T	

NOTE: Shim(s) used from kit will vary for pinion shaft adjustment. (See Differential Pinion Shaft Adjustment in Section 80, Group 35.)

SW03989,0000C5F -19-11NOV10-2/2

Drive/Pinion Shaft (PRT)



A—Wedge Nut
B—Collared Jam Nut
C—Spacer
D—Retaining Ring
E—Nut
F—Lock Washer
G—Outer Bearing Retainer

H—Shims (used as needed)
I—Bearing
J—Coupler Gear
K—Cap Screw
L—Inner Bearing Retainer
M—Spacer
N—Gear, 20T

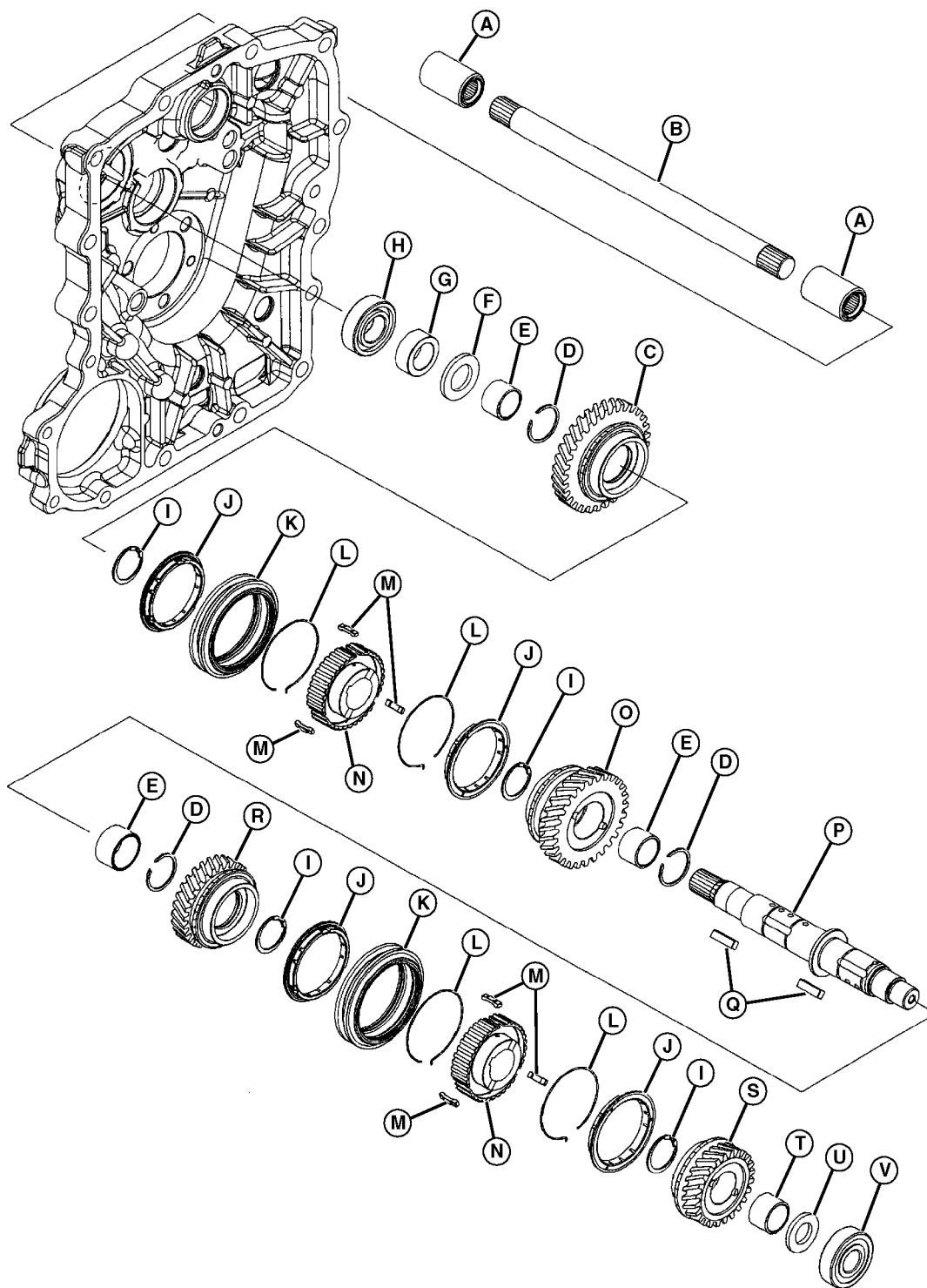
O—Shift Collar
P—Long Splined Collar
Q—Retaining Ring
R—Spacer
S—Gear, 35T
T—Retaining Ring
U—Short Splined Collar

V—Retaining Ring
W—Gear, 51T
X—Bearing
Y—Drive/Pinion Shaft

LVAL12274 —UN—29OCT10

SW03989,0000C60 -19-05NOV10-1/1

4 Speed Gear Shaft (PRT)



A—Coupler
B—Shaft
C—Gear, 33T
D—Retaining Ring
E—Needle Bearing
F—Thin Spacer

G—Wide Spacer
H—Bearing
I—Retaining Ring
J—Synchromesh Gear
K—Shift Collar

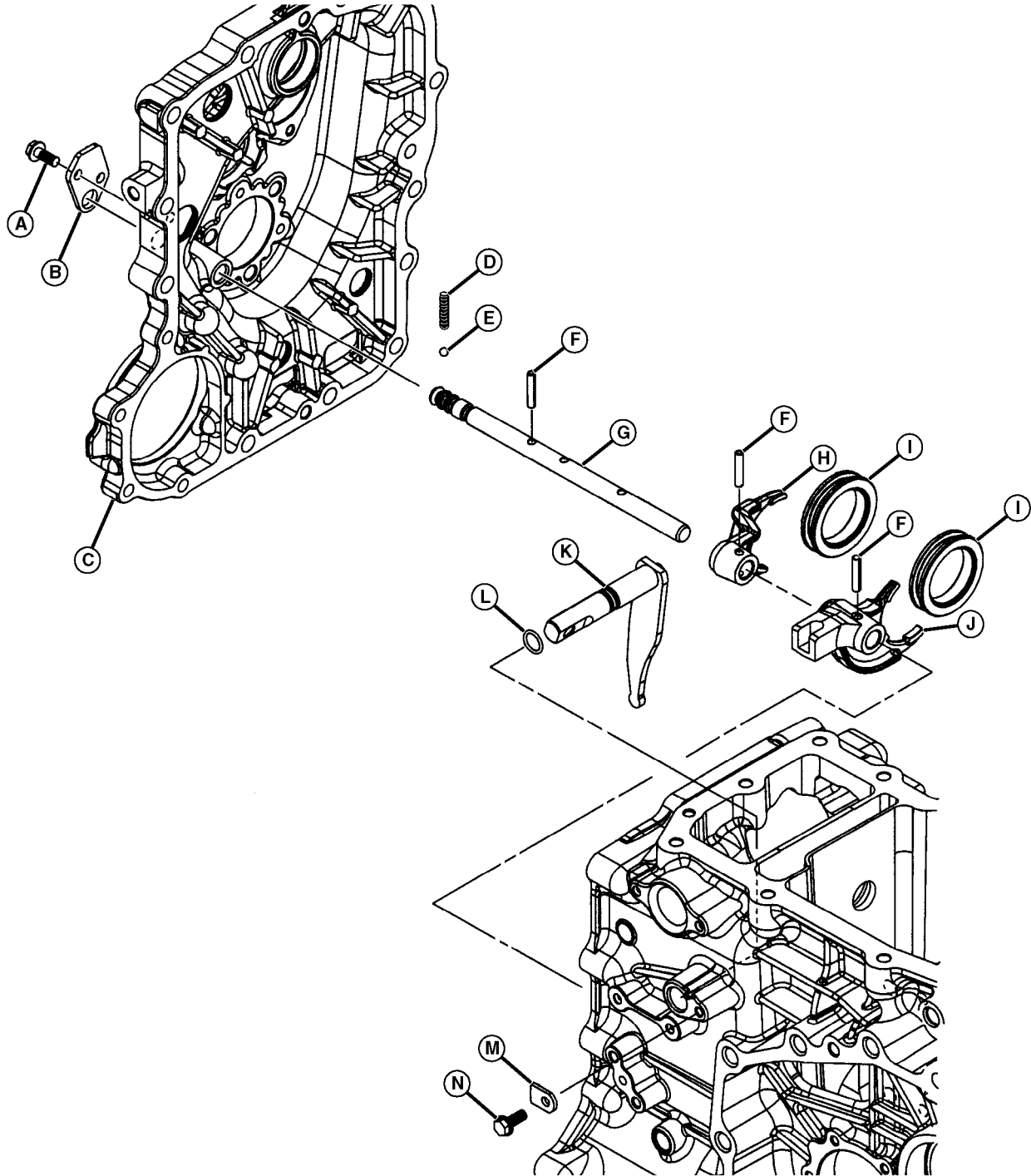
L—Wire Ring Clip
M—Ring Keys
N—Synchromesh Ring
O—Gear, 29T
P—Shaft
Q—Keys

R—Gear, 23T
S—Gear, 26T
T—Needle Bearing
U—Thin Spacer
V—Bearing

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SW03989,0000C61 -19-05NOV10-1/1

Range Shift



A—Bolt
B—Plate, Fork Lock
C—Center Plate
D—Spring
E—Ball, 1/4 in.

F—Roll Pin (3 used)
G—Range Shift Shaft
H—Range Shift Fork

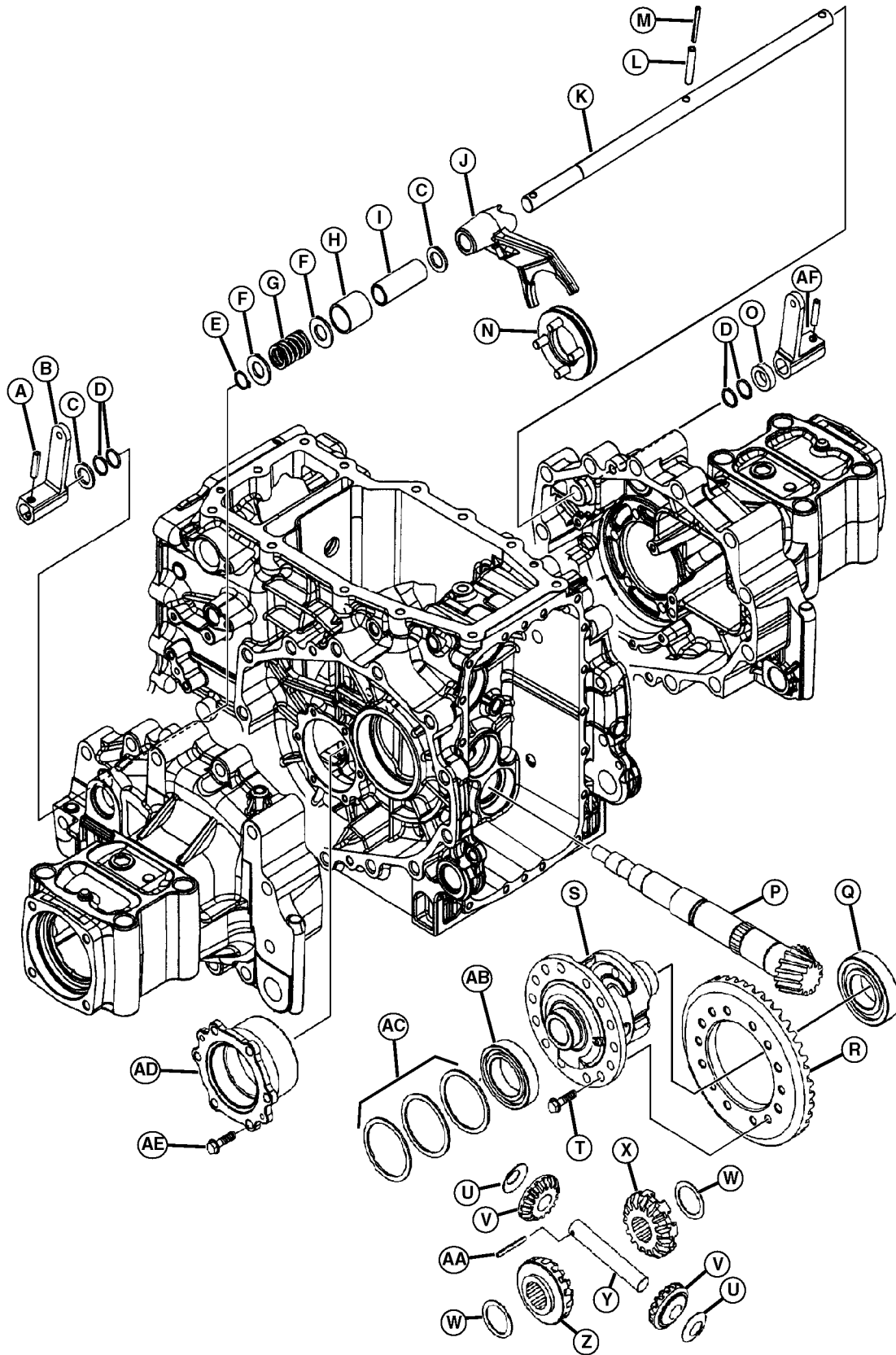
I—Shift Collar (2 used)
J—Range Shift Fork
K—Fork Shift Shaft

L—O-ring
M—Plate, Keep
N—Bolt

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Differential Assembly



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SW03989,0000C63 -19-11NOV10-1/2

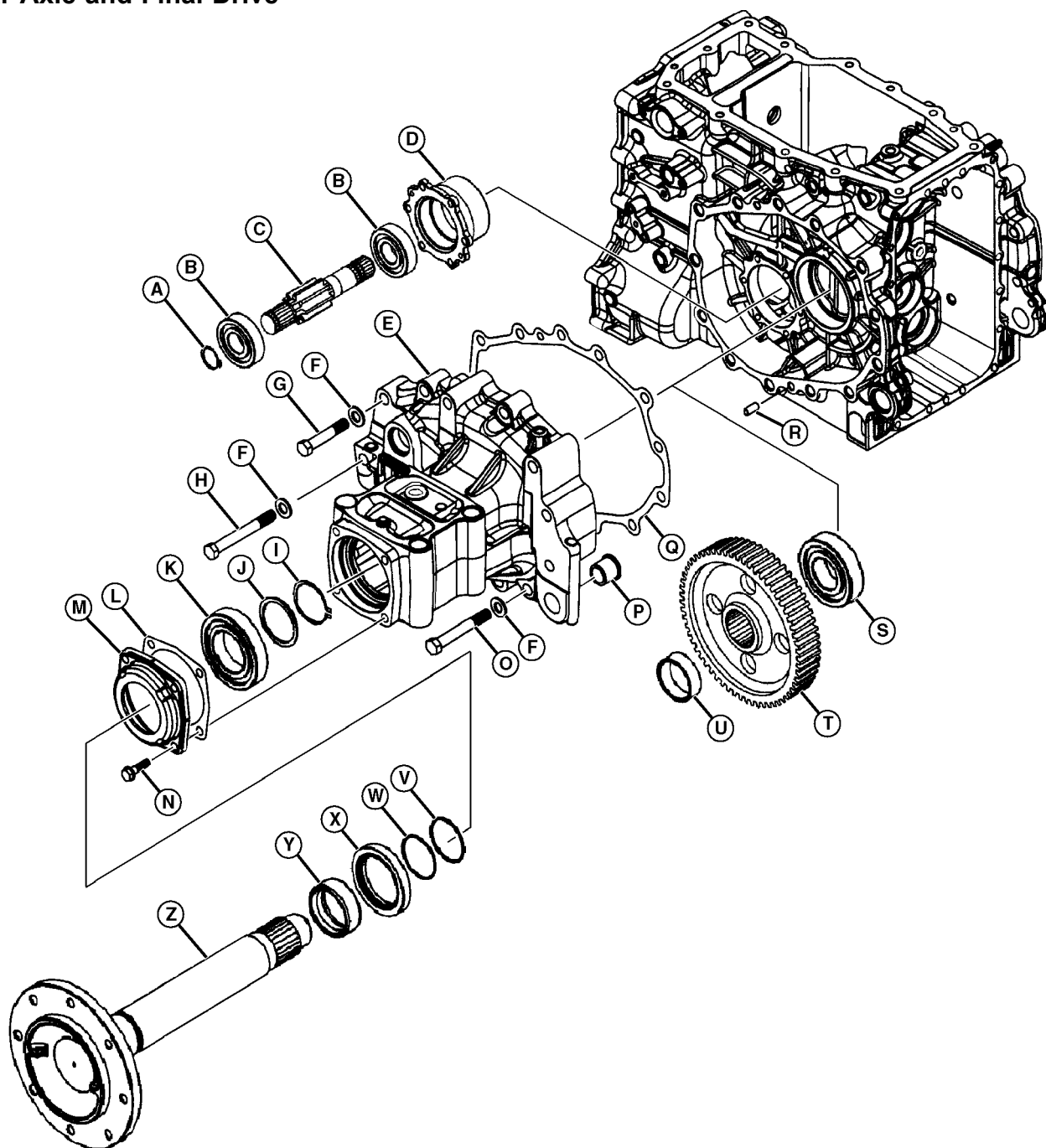
Component Location

A—Spring Pin	J—Differential Shift Fork	T—Bolt (14 used)	Z—Differential Side Gear
B—Differential Lock Arm (2 used)	K—Differential Lock Fork Shaft	U—Washer, Differential (2 used)	AA—Spring Pin
C—Spacer, 20x30x3.2 (2 used)	L—Spring Pin	V—Pinion Gear (2 used)	AB—Bearing
D—O-ring (4 used)	M—Spring Pin	W—Washer, Differential (2 used)	AC—Shim(s)
E—Circlip	N—Locking Collar	X—Differential Side Gear	AD—Differential Carrier
F—Washer, 20x38x3.2 (2 used)	O—Spacer	Y—Pinion Shaft, Differential	AE—Bolt (6 used)
G—Spring	P—Pinion Shaft		AF—Spacer
H—Collar	Q—Bearing		
I—Spacer	R—Ring Gear		
	S—Differential Case Assembly		

NOTE: Shim(s) used will vary for backlash adjustment.
(See Differential Backlash Adjustment in
Section 80, Group 35.)

SW03989,0000C63 -19-11NOV10-2/2

Rear Axle and Final Drive



A—Snap Ring (1 per side)
 B—Bearing (2 per side)
 C—Final Pinion (Left)
 D—Differential Carrier
 E—Axle Housing (Left)
 F—Washer, 15x28x2.5 (13 per side)
 G—Bolt, M14x75 (6 per side)

H—Bolt, M14x110 (5 per side)
 I—Snap Ring (1 per side)
 J—Washer, 60x72x3 (1 per side)
 K—Bearing (1 per side)
 L—Gasket (1 per side)
 M—Cover, Oil Seal (1 per side)
 N—Bolt, M10x35 (4 per side)

O—Bolt, M14x95 (2 per side)
 P—Bushing (1 per side)
 Q—Gasket (1 per side)
 R—Pin (2 per side)
 S—Bearing (1 per side)
 T—Final Gear (1 per side)
 U—Collar (1 per side)
 V—Snap Ring (1 per side)

W—Washer, 60x72x3 (1 per side)
 X—Seal (1 per side)
 Y—Seal Collar (1 per side)
 Z—Rear Axle Shaft (1 per side)

LVAL12278—UN—29OCT10

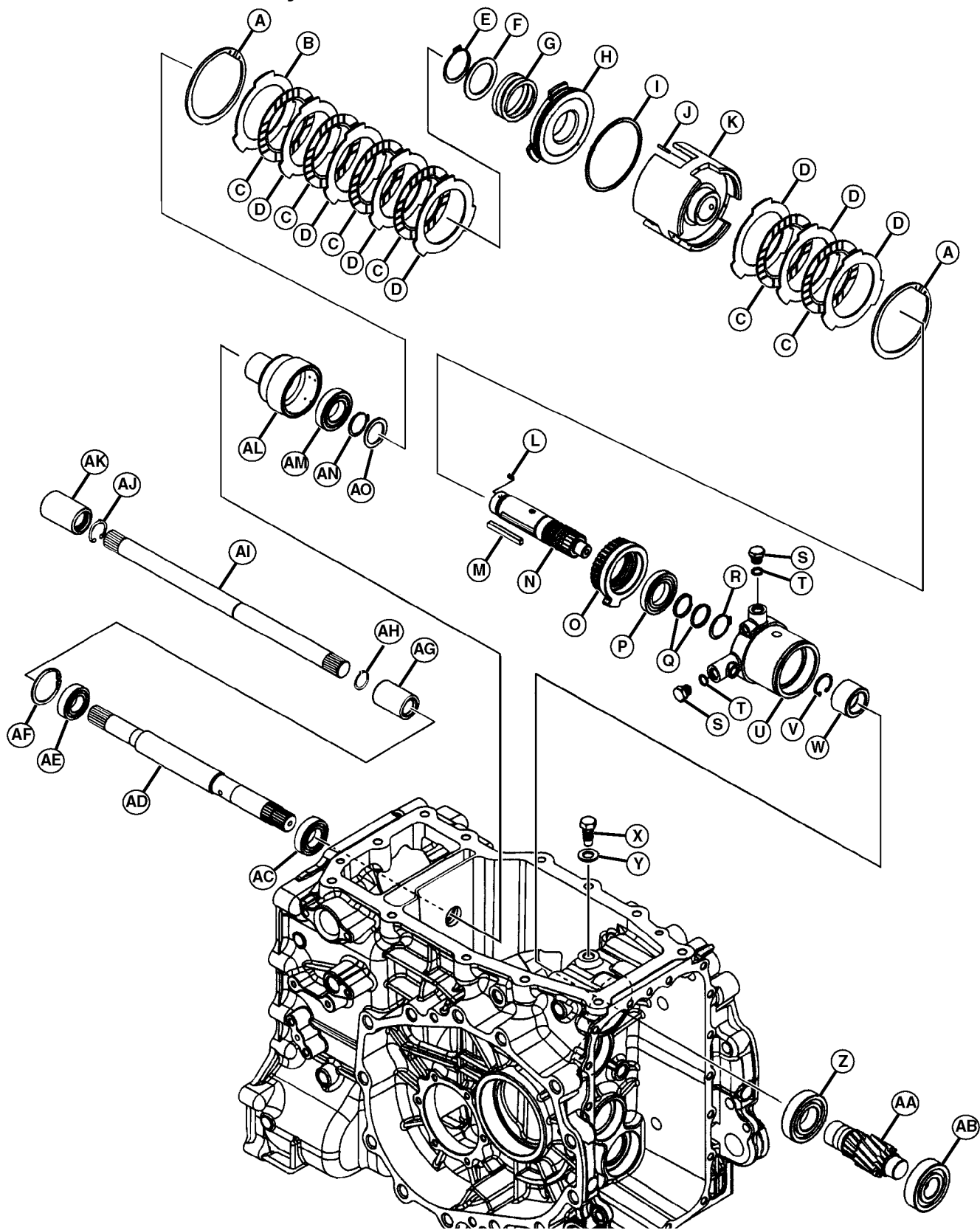
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Brake Component Location

For brake component location, see Brake Assembly in Section 110, Group 10.

SW03989,0000C65 -19-11FEB11-1/1

PTO Clutch/Brake Assembly



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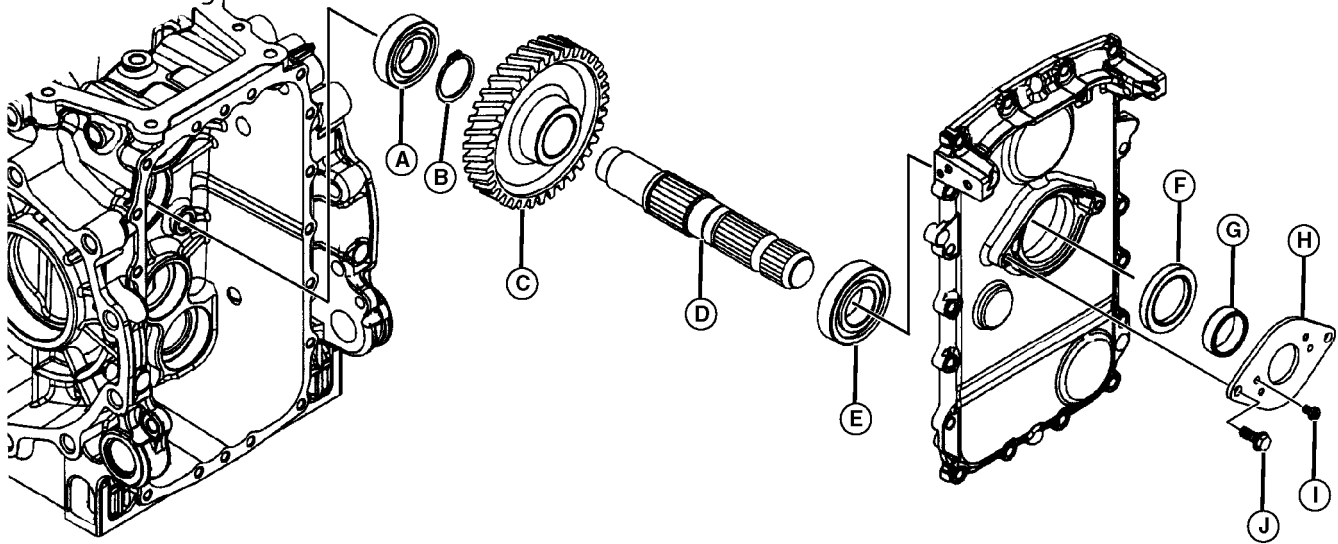
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Component Location

A—Circlip (2 used)	K—Clutch Cylinder	U—PTO Adaptor	AH—Snap Ring
B—Plate, Steel	L—Plug	V—Circlip	AI— PTO Drive Shaft (eHydro)
C—Plate, Friction (6 used)	M—Key, 7x5.8x55	W—Coupling	AJ—Circlip (eHydro)
D—Plate, Steel (7 used)	N—PTO Clutch Shaft	X—Bolt	AK—Coupling (eHydro)
E—Snap Ring	O—PTO Brake Boss	Y—Washer	AL—Boss
F—Spring Retainer	P—Bearing	Z—Bearing	AM—Bearing
G—Spring	Q—Seal Ring (2 used)	AA—PTO Gear, 13T	AN—Snap Ring
H—Clutch Piston	R—Snap Ring	AB—Bearing	AO—Washer
I— O-ring	S—Plug (2 used)	AC—Bearing	
J— Pin (3 used)	T—O-ring (2 used)	AD—PTO Drive Shaft	
		AE—Bearing	
		AF—Circlip	
		AG—Coupling, Splined	

SW03989,0000C66 -19-05NOV10-2/2

PTO Rear Shaft



A—Bearing
B—Snap Ring
C—PTO Gear, 62T

D—PTO Stub Shaft
E—Bearing
F—Seal
G—Collar

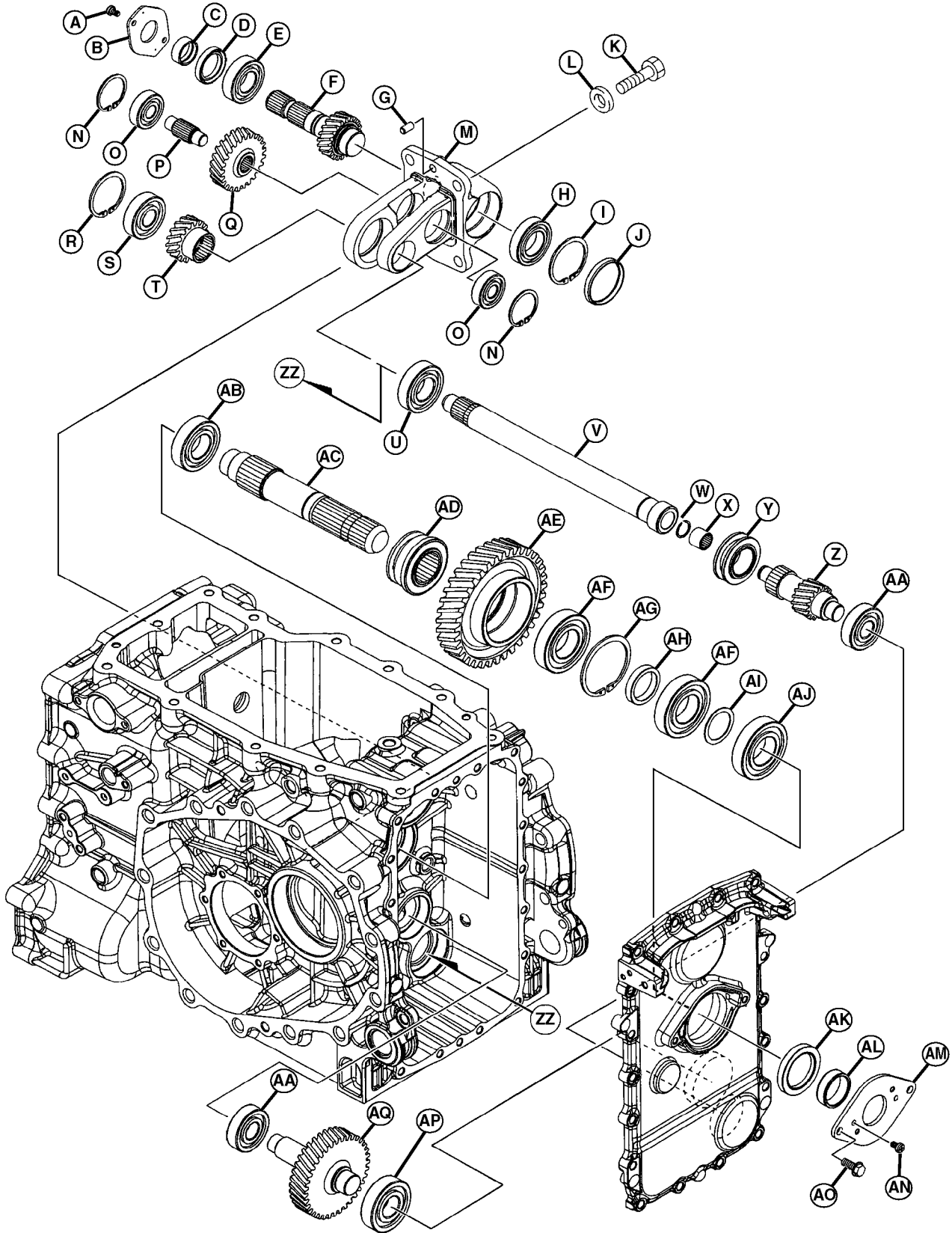
H—PTO Shield Plate
I— Pin, Cover Hook (2 used)

J— Bolt (2 used)

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Rear and Mid PTO Shafts



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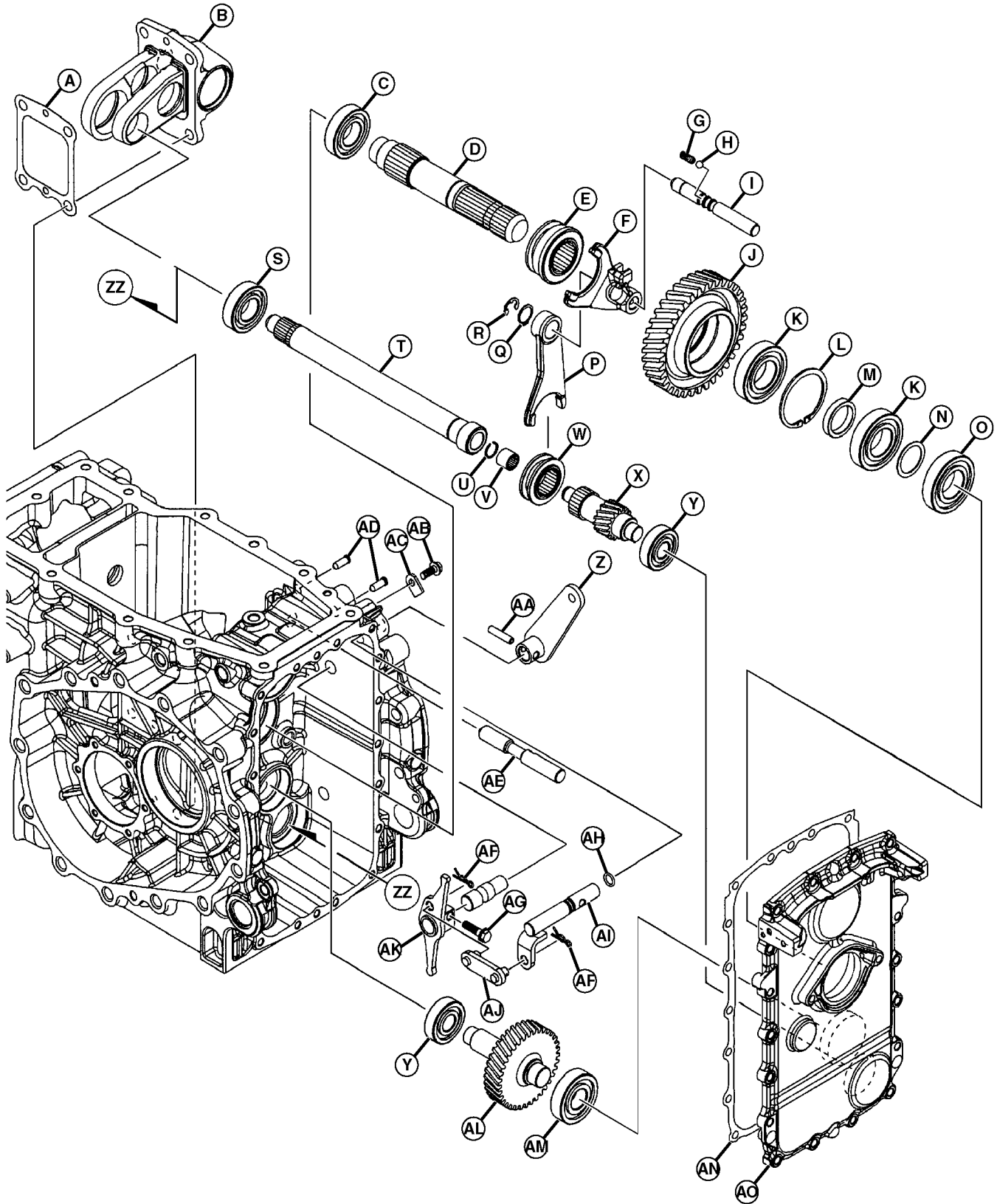
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Component Location

A—Pin, Cover Hook (2 used)	M—Mid PTO Case	Y—Mid PTO Shift Collar	AI—Washer
B—Mid PTO Shield Plate	N—Circlip (2 used)	Z—Mid PTO Shaft, 15T	AJ—Bearing
C—Collar	O—Bearing (2 used)	AA—Bearing (2 used)	AK—Seal
D—Seal	P—Mid PTO Shaft	AB—Bearing	AL—Collar
E—Bearing	Q—Gear, 25T	AC—PTO Shaft	AM—PTO Shield Plate
F—Mid PTO Shaft	R—Circlip	AD—Mid PTO Shift Collar	AN—Pin, Cover Hook (2 used)
G—Pin (2 used)	S—Bearing	AE—PTO Gear, 62T	AO—Bolt (2 used)
H—Bearing	T—Mid PTO Gear, 17T	AF—Bearing (2 used)	AP—Bearing
I—Circlip	U—Bearing	AG—Circlip	AQ—Mid PTO Gear Shaft, 41T
J—Cover	V—Mid PTO Coupling Shaft	AH—Spacer, 35x43x9	
K—Bolt (4 used)	W—Ring		
L—Washer (4 used)	X—Needle Bearing		

SW03989,0000C68 -19-05NOV10-2/2

Rear and Mid PTO Shift Assembly



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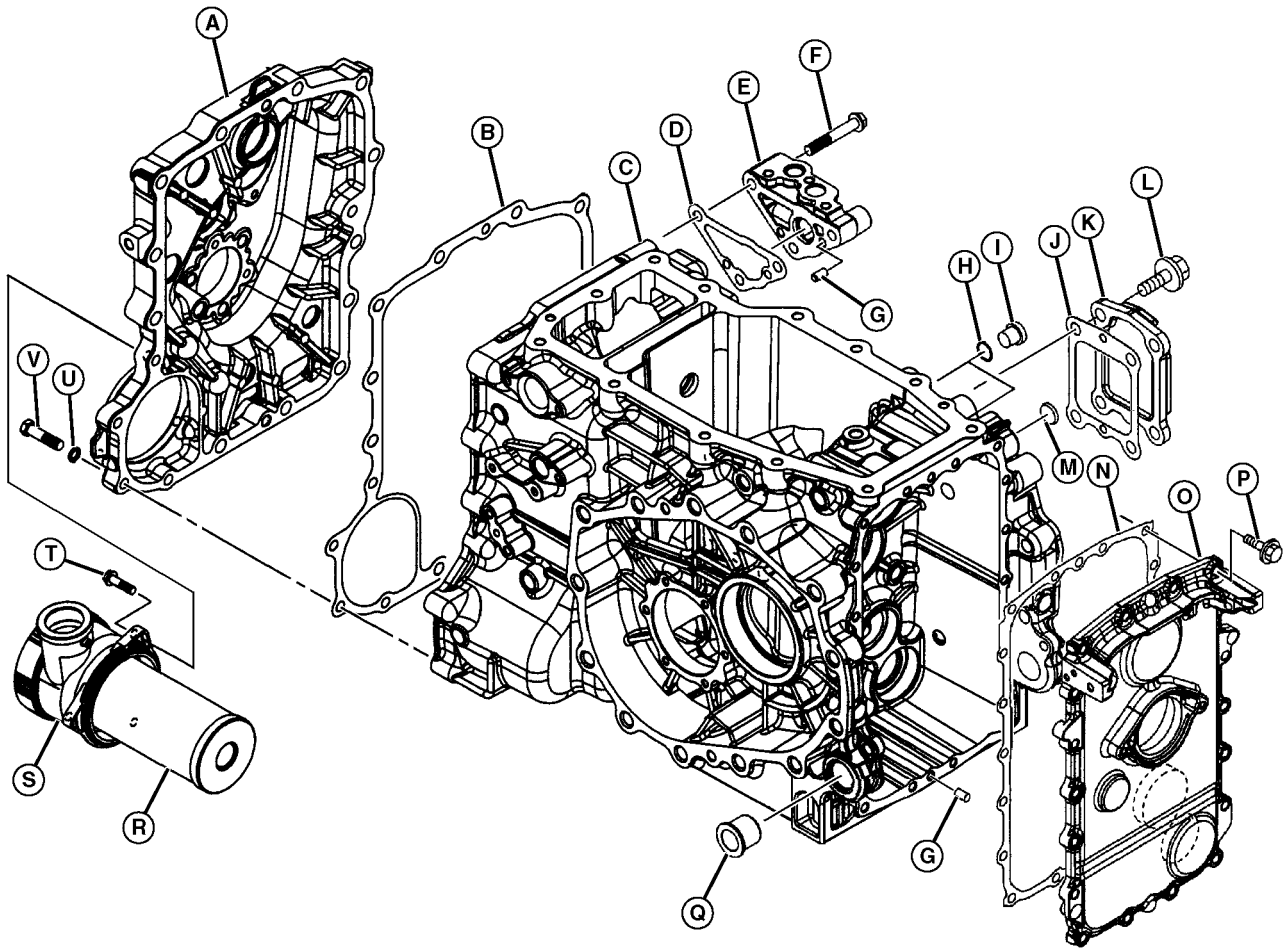
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Component Location

A—Gasket, Mid PTO	L—Circlip	X—Mid PTO Shaft, 15T	AH—O-ring
B—Mid PTO Case	M—Spacer, 35x43x9	Y—Bearing (2 used)	AI— Arm, Link
C—Bearing	N—Washer	Z—Shift Arm	AJ—Link Plate
D—PTO Shaft	O—Bearing	AA—Spring Pin	AK—Arm, Shift
E—Mid PTO Shift Collar	P—Shift Fork, Mid PTO	AB—Bolt	AL—Mid PTO Gear Shaft, 41T
F—Shift Fork, Rear PTO	Q—Circlip	AC—Keeper Plate	AM—Bearing
G—Spring	R—C-Clip	AD—Push Pin (2 used)	AN—Gasket
H—Ball, 5/16	S—Bearing	AE—Switch Shaft	AO—Rear Cover
I— Fork Shaft	T—Mid PTO Coupling Shaft	AF—Spring Clip (2 used)	
J—PTO Gear, 62T	U—Ring	AG—Bolt	
K—Bearing (2 used)	V—Needle Bearing		
	W—Mid PTO Shift, Collar		

SW03989,0000C69 -19-05NOV10-2/2

Transmission Housing (eHydro™)

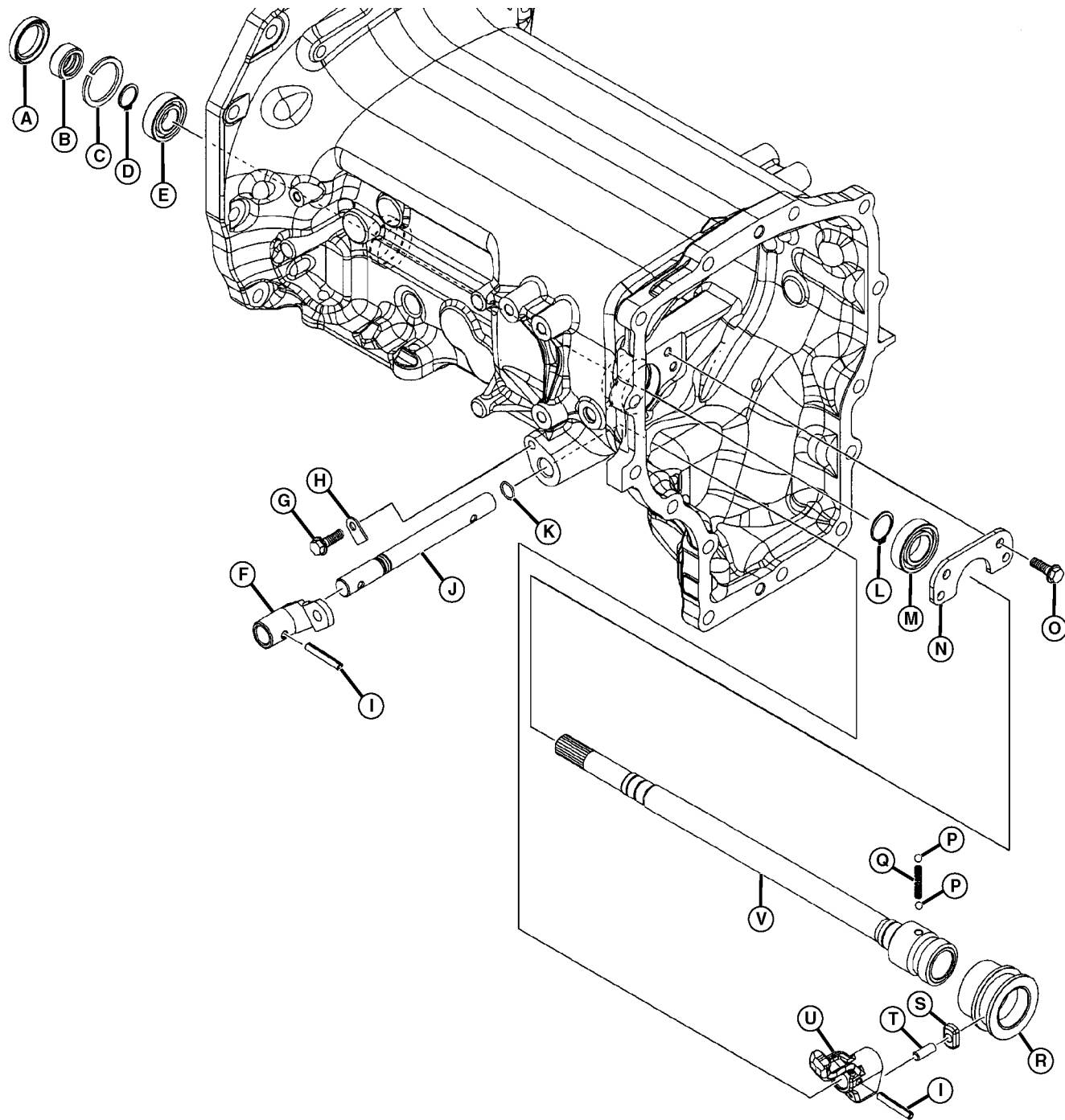


A—Center Plate	H—O-ring (2 used)	L—Bolt (4 used)	S—Filter Housing Assembly
B—Gasket	I— Plug (2 used)	M—Plug, Bore	T— Bolt (3 used)
C—Transmission Case	J— Gasket	N—Gasket	U—Washer (4 used)
D—Gasket	K—Side Cover (Replaced with Mid PTO case when Mid PTO option is installed)	O—Rear Cover	V—Bolt (4 used)
E—Main Shift Holder		P—Cap Screw (18 used)	
F—Bolt (3 used)		Q—Bushing (2 used)	
G—Pin (4 used)		R—Suction Filter	

LVAL12284—UN—25OCT10

SW03989,0000C6A -19-05NOV10-1/1

Front Drive (For MFWD)



A—Oil Seal
B—Sleeve, 20x30x13
C—Circlip
D—Snap Ring
E—Bearing
F—Shift Arm

G—Bolt
H—Keep Plate
I—Spring Pin (2 used)
J—Shift Shaft
K—O-ring
L—Snap Ring

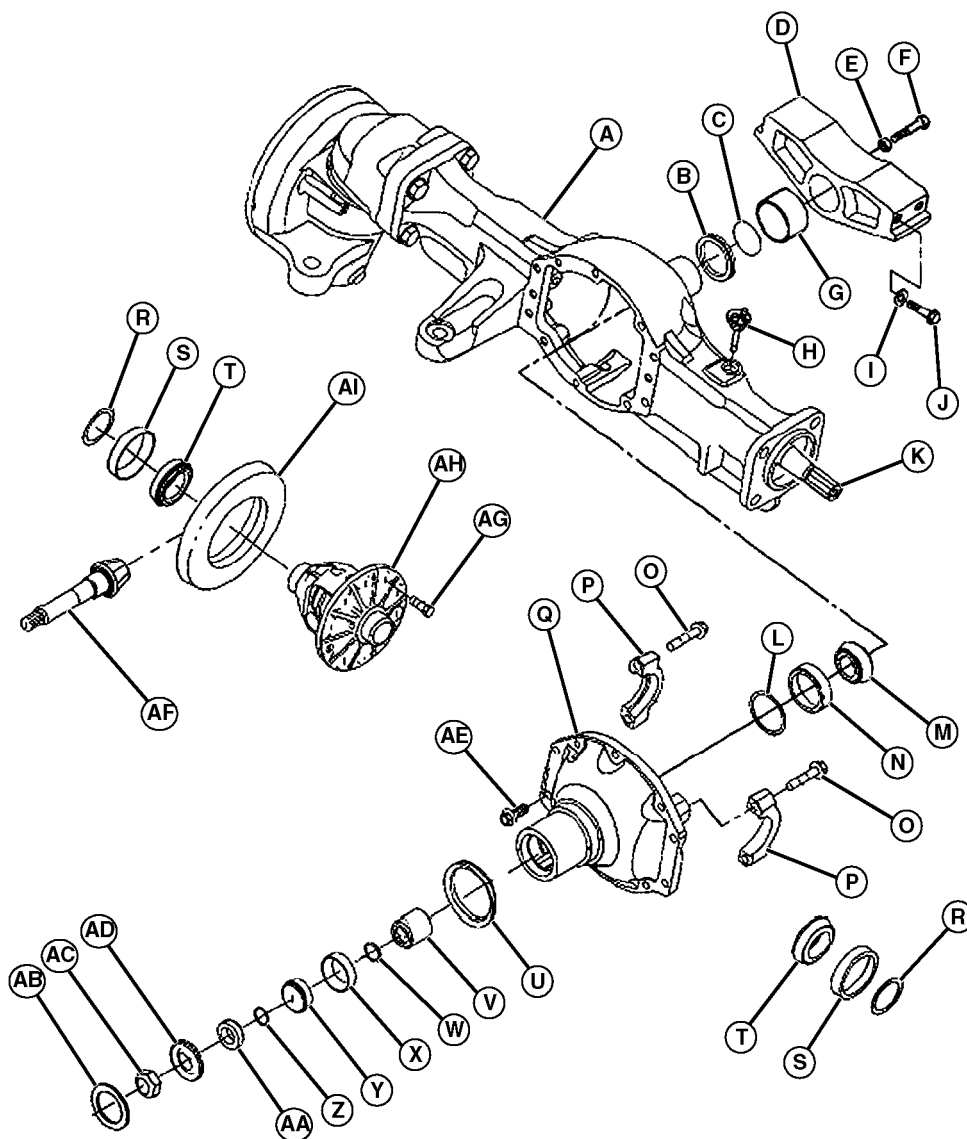
M—Bearing
N—Bearing Retainer
O—Bolt (4 used)
P—Ball, 1/4 in. (2 used)
Q—Spring

R—Shift Collar
S—Shift Shoe
T—Pin
U—Shifter
V—MFWD Drive Shaft

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SW03989,0000C6B -19-05NOV10-1/1

MFWD Front Axle Housing and Differential

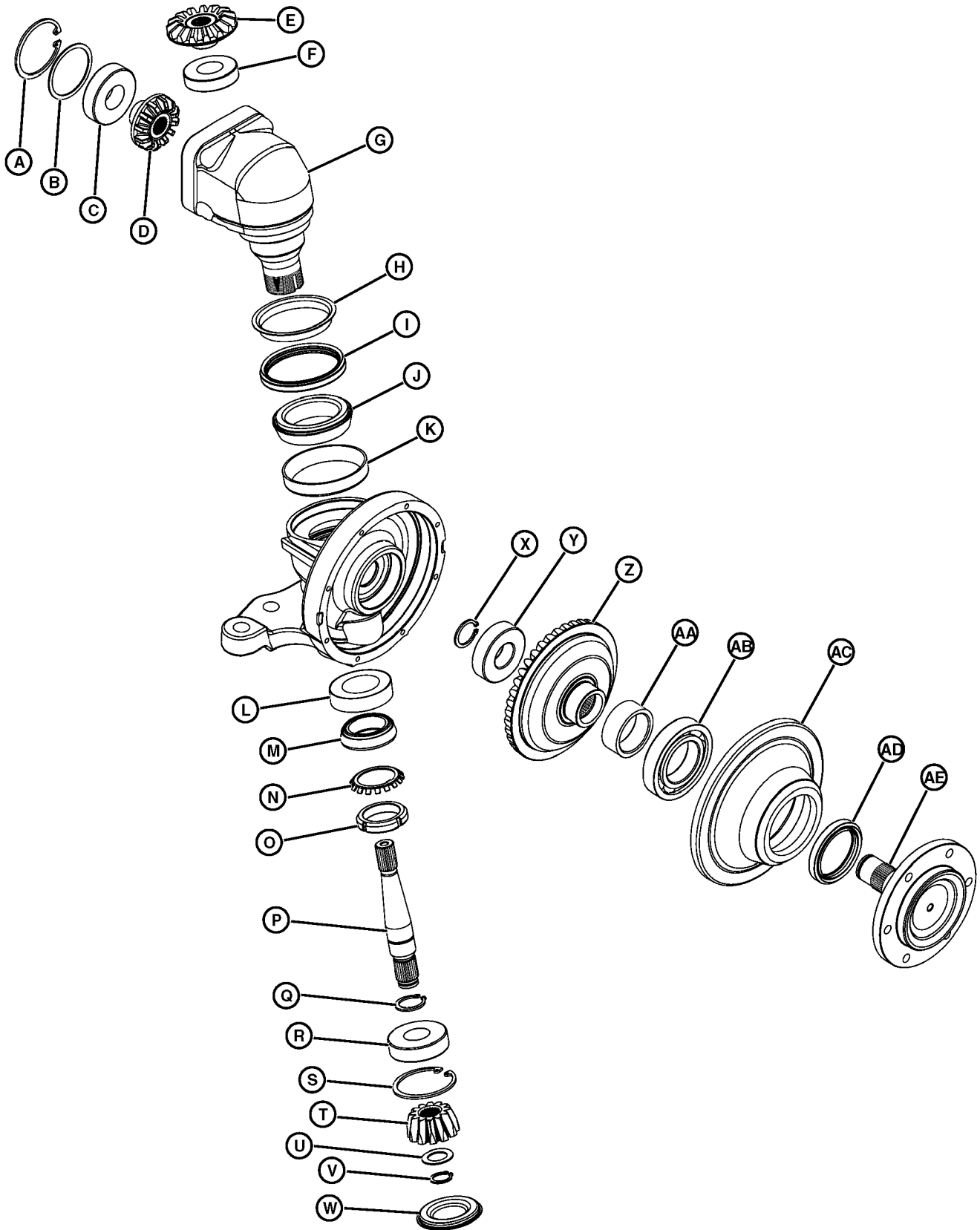


- | | | | |
|--------------------------|--------------------------------------|--------------------------------|----------------------------|
| A—Housing, Axle | K—Axle Shaft (RH Shown) | S—Bearing Cup | AB—Thrust Washer, Trunnion |
| B—V-ring Seal, Front | L—Shim, Inner Pinion | T—Bearing Cone | AC—Nut |
| C—Thrust Plate | M—Bearing Cone | U—V-ring Seal, Rear | AD—Seal |
| D—Trunnion | N—Bearing Cup | V—Spacer, Inner Pinion | AE—Bolt, M12x30 (12) |
| E—Nut, M8 | O—Screw | W—Shim, Pinion Bearing Preload | AF—Pinion |
| F—Cap Screw, M8x30 | P—Bearing Cap | X—Bearing Cup | AG—Bolt (10 used) |
| G—Bushing | Q—Housing, Carrier Sub-Assembly | Y—Bearing Cone | AH—Differential |
| H—Dipstick/Filler Cap | R—Shim, Differential Bearing Preload | Z—O-ring | AI—Ring Gear |
| I—Washer, 15.3x 32x4 (4) | | AA—Spacer, Outer Pinion | |
| J—Bolt, M14x40 (4) | | | |

SW03989,0000C6C -19-05NOV10-1/1

LVAL12286—UN—29OCT10

MFWD Final Drive Component Location



LVAL12287—UN—28OCT10

Continued on next page

SW03989,0000C6D -19-05NOV10-1/2

Component Location

A—Snap Ring
B—Shim(s) A/R
C—Bearing
D—Bevel Gear, 12T
E—Bevel Gear, 15T
F—Bearing
G—Spindle Housing
H—Wear Sleeve

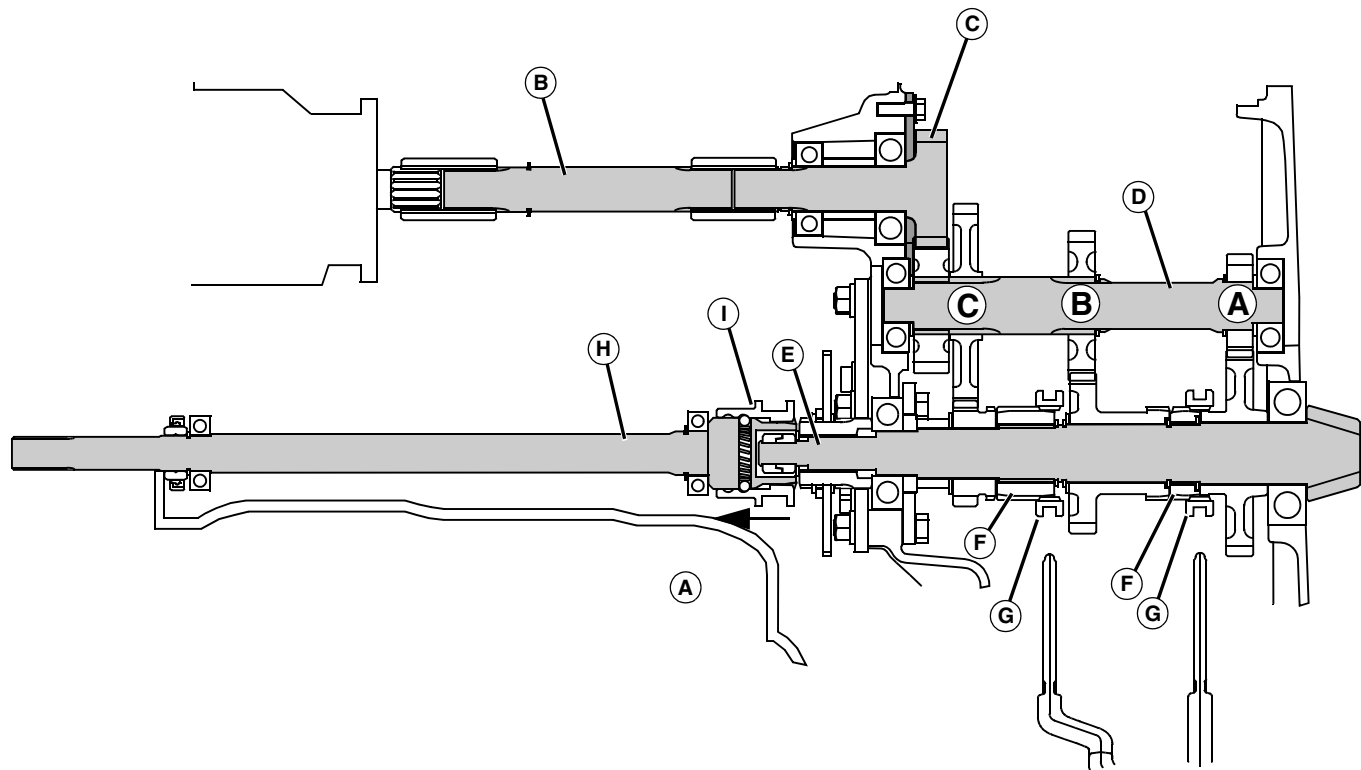
I— Seal
J— Tapered Bearing
K—Bearing Cone
L—Bearing Cone
M—Tapered Bearing
N—Washer, Locking
O—Special Nut
P—Spindle Shaft

Q—Snap Ring
R—Ball Bearing
S—Snap Ring
T—Bevel Gear, 12T
U—Washer
V—Snap Ring
W—Cover
X—Snap Ring
Y—Ball Bearing

Z— Bevel Gear, 41T
AA—Spacer
AB—Bearing
AC—Outer Drive Cover
AD—Seal
AE—Hub Shaft

SW03989,0000C6D -19-05NOV10-2/2

Range Transmission—eHydro™



LVAL12288 —UN—29OCT10

- | | | |
|---|----------------------------------|--------------------------------|
| A—MFWD Engaged | D—Reduction Shaft | G—Shifter (2 used) |
| B—Driven Shaft | E—Pinion Shaft | H—MFWD Drive Shaft |
| C—Constantly Engaged Gear (7 used) | F—Splined Sleeve (2 used) | I— Splined Shift Collar |

Operation:

When the transmission is engaged, power from the driven shaft (B) is transferred through a constantly engaged gear (C) to a reduction shaft (D). There are three gears on the reduction shaft that are continuously engaged to three gears on the pinion shaft (E). The three gears on the pinion shaft spin freely on the shaft.

Between the three gears on the pinion shaft there are two splined sleeves (F). There are two shifters (G) that slide forward and rearward on the splined sleeves.

The forks secured to the range shift linkage fit into the two shifters (G) and selection of the range shifter moves the forks and shifters forward and rearward. The shifters lock (only one at a time) the gears on the pinion shaft to one of the splined sleeves (F).

The diagram below shows the shifters in the rear most (A gear) position.

There are four positions for the shifters (from rear to front):

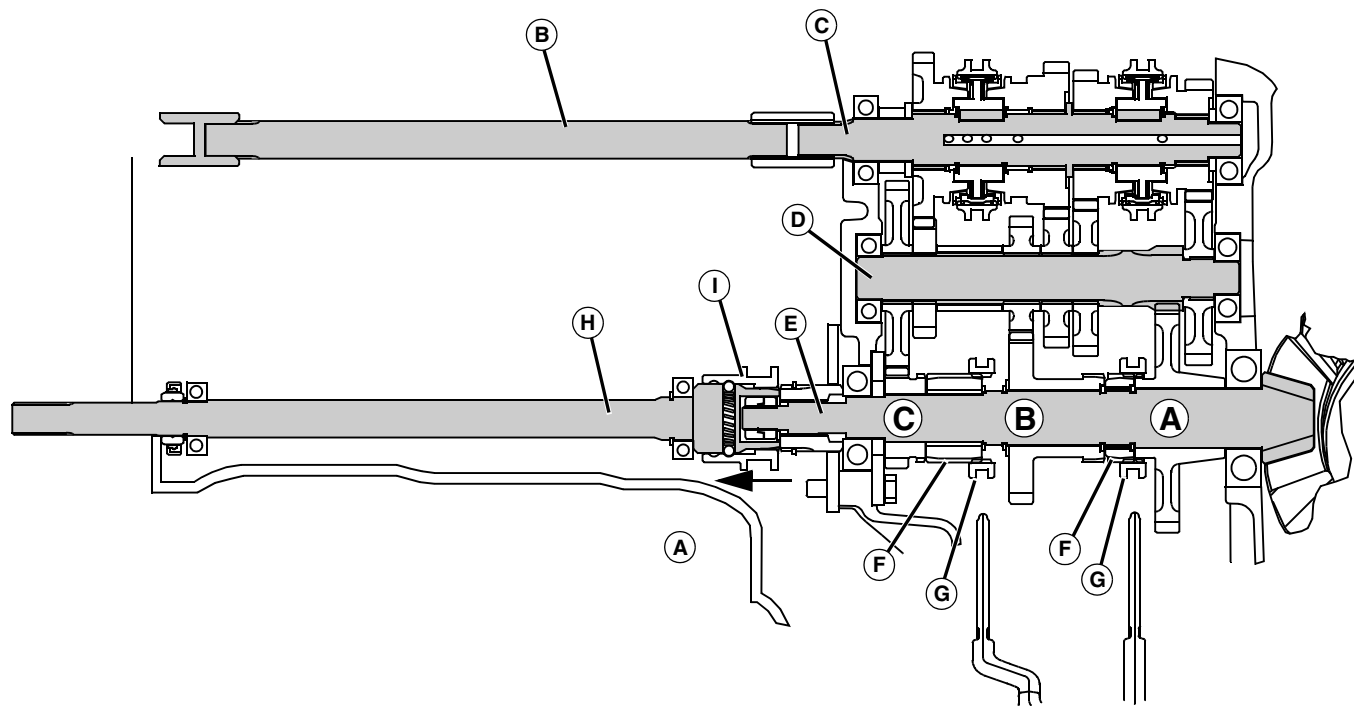
- Rear most—A
- Next forward—Neutral (no gear locked to sleeves)
- Next forward—B
- Most forward—C

MFWD Drive:

The MFWD drive shaft (H) has a rear hub that fits over the front end of the pinion shaft (F). A splined shift collar (I) can be moved toward the pinion shaft which locks the MFWD drive shaft to the pinion shaft. The collar is shown disengaged from the pinion shaft. (See MFWD Power Operation in Section 80, Group 15.)

SW03989,0000C6E -19-11NOV10-1/1

Range Transmission—PRT



A—MFWD Disengaged
B—Driven Shaft
C—4-Speed Gear Shaft

D—Mid Shaft
E—Pinion Shaft
F—Splined Sleeves (2 used)

G—Shifters (2 used)
H—MFWD Drive Shaft
I— Splined Shift Collar

Operation:

When the transmission is engaged, power from the driven shaft (B) is transferred through a splined coupler to the 4-speed gear shaft (C). The four gears on the shaft all spin freely on the shaft. Each of the four gears is engaged to a fixed gear on the mid shaft (D). There are two shift collars on the gear shaft that can engage any one of the gears to the shaft. When one of them is engaged, the mid shaft rotates. (See [Transmission Operation](#) in Section 60, Group 15.)

All of the gears on the mid shaft are splined to the shaft and rotate any time one of the 4-speed gears is engaged. There are three gears on the mid shaft that are continuously engaged to three gears on the pinion shaft (E). The three gears on the pinion shaft spin freely on the shaft.

Between the three gears on the pinion shaft there are two splined sleeves (F). There are two shifters (G) that slide forward and rearward on the splined sleeves.

The forks secured to the range shift linkage fit into the two shifters (G) and selection of the range shifter moves the

forks and shifters forward and rearward. The shifters lock (only one at a time) the gears on the pinion shaft to one of the splined sleeves (F).

The diagram below shows the shifters in the rear most (A gear) position.

There are four positions for the shifters (from rear to front):

- Rear most—A
- Next forward—Neutral (no gear locked to sleeves)
- Next forward—B
- Most forward—C

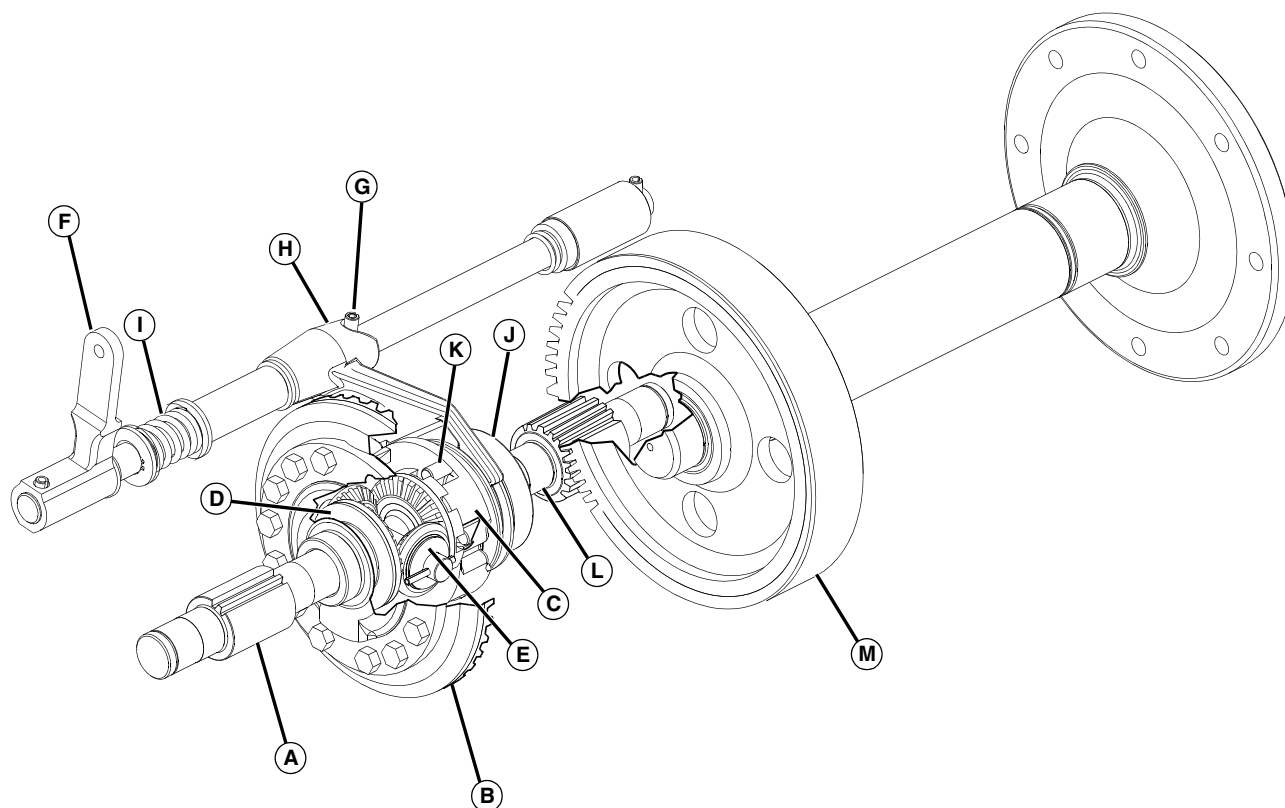
MFWD Drive:

The MFWD drive shaft (H) has a rear hub that fits over the front end of the pinion shaft (E). A splined shift collar (I) can be moved toward the pinion shaft which locks the MFWD drive shaft to the pinion shaft. The collar is shown disengaged from the pinion shaft. (See [MFWD Power Operation](#) in Section 80, Group 15.)

LVAL12289—UN—29OCT10

SW03989.0000C6F -19-11NOV10-1/1

Differential Power Flow and Lock



A—Pinion Shaft
B—Ring Gear
C—Carrier
D—Bevel Gear (2 used)

E—Bevel Pinion (2 used)
F—Shaft Lever
G—Pin

H—Fork
I—Spring
J—Lock Collar
K—Pins
L—Pinion Shaft

M—Bull Gear

Function:

To transmit power from the counter shaft to the axle shaft.

Power Flow Operation:

Power from the transmission pinion drive shaft is transmitted through the differential assembly to the final pinion shaft (A). The left axle final drive pinion shaft is in constant mesh with the differential assembly.

The differential assembly is a ring gear (B) bolted to the carrier (C). Inside the carrier are two bevel gears (D) and two bevel pinions (E).

When the machine turns sharply, one axle is held stationary. The result is that the bevel pinions rotate on their own axis and walk around the stationary bevel gears. The turning ring gear transmits power through the pinion to the opposite bevel gear.

Differential Operation:

Engaging the differential lock locks the two differential output shafts together and keeps an equal amount of power to both axles (eliminates differential action).

Depressing the pedal pulls the differential shaft lever (F) and rotates a pin (G) that sets in the ramp on the fork (H). As the pin rotates it forces the fork to the left. This compresses the spring (I) and forces the differential lock collar (J) toward the differential carrier (C).

When the pins (K) on the collar align with the holes in the carrier, the pins will slip into the holes. Since the collar is splined to the right differential output shaft, no differential action will take place and both output pinion shafts (A and L) turn equally.

The output pinion shafts (A and L) are meshed in gear to the axle bull gears (M). The bull gears are splined to the axles and wheel hubs.

LVAL12290 —UN—29OCT10

Continued on next page

SW03989,0000C70 -19-05NOV10-1/2

When the pedal is released the spring will disengage the differential lock once the torsional forces on the axles are reduced.

SW03989,0000C70 -19-05NOV10-2/2

MFWD Power Operation

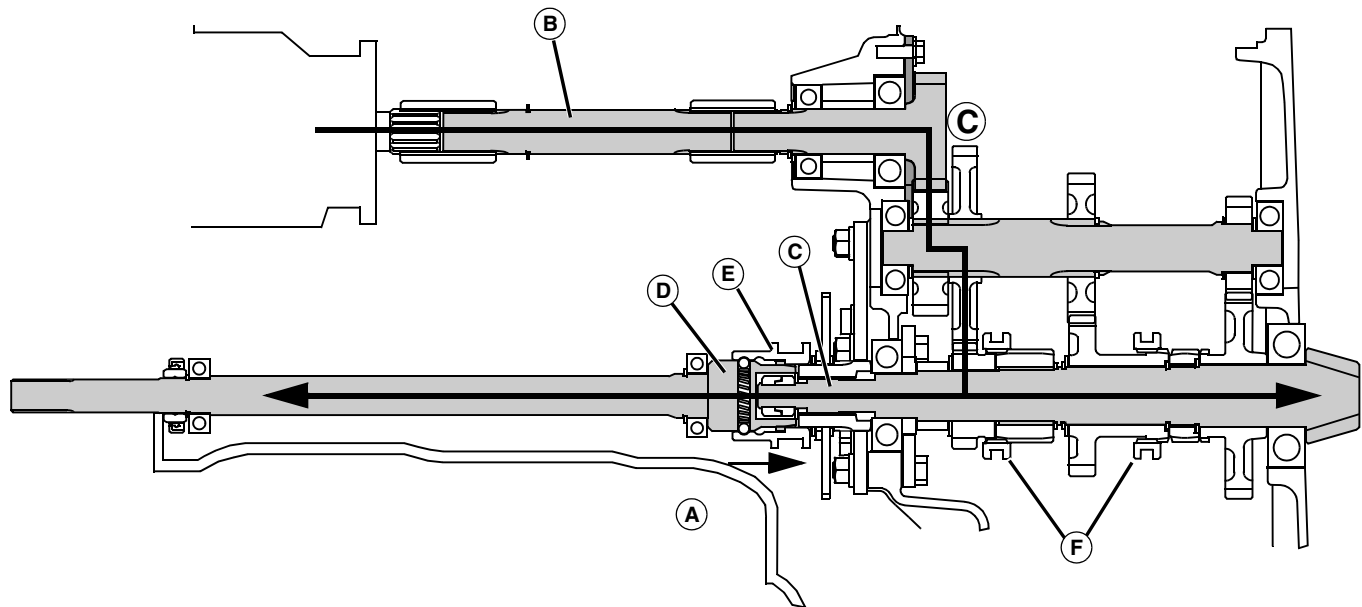
Operation:

When the transmission is engaged, power from the driven shaft (B) is transferred the pinion shaft (C). (See [Range Transmission—eHydro™](#) in Section 80, Group 15.)

When the pinion shaft is powered, it spins freely inside the hub (D) of the MFWD drive shaft.

When the front wheel drive is engaged, linkage moves a fork that is fitted into the shift collar (E). The mid shift collar is splined to the front drive shaft and moves rearward engaging the front drive gear locking the gear to the shaft. This provides power to the front axle transmission.

The diagram below shows the range shifters (F) in the front (3rd gear—C Range) position, and the MFWD is shown engaged. Power flow is shown with the solid arrow.



A—MFWD Engaged
B—Driven Shaft

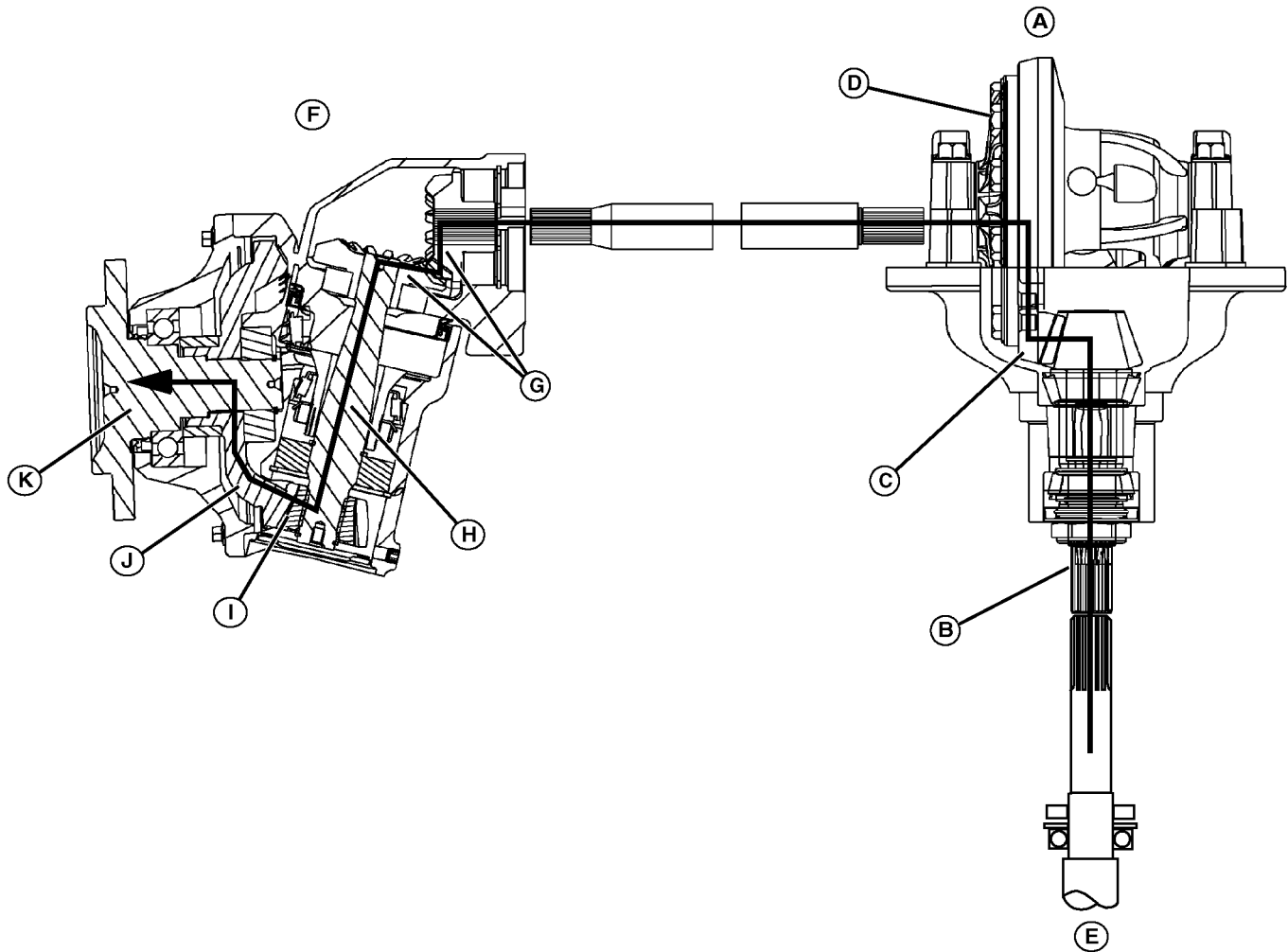
C—Pinion Shaft
D—Hub
E—Shift Collar

F—Range Shifters (2 used)

LVAL12291 —UN—29OCT10

SW03989,0000C71 -19-12NOV10-1/1

MFWD Front Axle



MFWD Front Axle; LH Spindle (rear view) and Differential (top view)

- | | | | |
|--------------------------|------------------------|-----------------------|-------------------|
| A—Top view | D—Differential Housing | G—Bevel Gear (2 used) | J—Bevel Gear |
| B—Differential Pinion | E—MFWD Drive Shaft | H—Spindle Shaft | K—Wheel Hub Shaft |
| C—Differential Ring Gear | F—Rear View | I—Bevel Gear | |

Function:

The front axle provides a means to transfer power from the drive shaft to the front wheels.

Theory:

The differential pinion (B) is splined to the MFWD drive shaft. The MFWD drive shaft transfers power from the transmission pinion to the front axle. The differential pinion drives the differential ring gear (C). The ring gear is bolted to the differential gear housing (D).

The RH and LH axle shaft are splined into the differential in the center of the axle and drive the RH and LH wheel spindles through bevel gears.

The bevel gears (G) are splined to the axle and the spindle shaft (H) and transfer power from the axle to the spindle shaft.

The bevel gear (G) splined to the bottom of the spindle shaft is engaged to the bevel gear (J). The bevel gear is splined to the wheel hub shaft (K).

LVAL12292 —UN—29OCT10

SW03989,0000C72 -19-05NOV10-1/1

Symptom: PTO Diagnostics Table

Symptom	Problem	Solution
PTO does not function correctly	PTO Does Not Engage.	Low hydraulic oil pressure. (See PTO Clutch Pressure Test in Section 90, Group 30.)
		PTO shaft, gear, or bearing failure.
		PTO clutch worn or damaged.
	Rear PTO Operates, but Mid PTO Will Not Engage.	PTO solenoid will not engage. (See Rear PTO Solenoid Tests .)
		PTO shaft, gear, or bearing failure.
	Engine Stalls When PTO Engaged.	Mid PTO shift mechanism damaged or needs adjustment.
		PTO shaft, gear, or bearing failure.
PTO Will Not Stay Engaged.	PTO Shaft Slows Down.	Use higher engine rpm Check engine performance.
		Excessive load on PTO output shaft (implement too large). Remove load.
		PTO shaft, gear, or bearing failure.
PTO Shaft Will Not Stop or Slow Down.	PTO Shaft Will Not Stop or Slow Down.	PTO clutch worn or damaged.
		Use higher engine rpm Check engine performance.
		Excessive load on PTO output shaft (implement too large). Remove load.

SW03989,0000C73 -19-18DEC12-1/1

Final Drive Diagnosis

Test/Check Point	Normal	If Not Normal
Range Shift Lever	Smooth operation; engages gear.	Replace damaged parts.
Rear Wheels	Smooth, quiet operation in forward, or reverse motion; wheels do not scrub when turning.	Check that differential locking lever disengages when not depressed. Replace damaged parts in differential.
Differential Lock Pedal	Smooth operation; engages differential lock.	Lubricate linkage. Replace damaged parts.
Front Wheels (MFWD)	Smooth, quiet operation in forward, or reverse motion; wheels do not scrub excessively when turning.	Replace damaged parts in front differential.
MFWD Lever	Smooth operation; engages MFWD.	Lubricate linkage or replace damaged parts.

SW03989,0000C74 -19-05NOV10-1/1

Troubleshooting Table

Problem or Symptom	Possible Cause
Wheels On Machine Will Not Rotate	Hydraulic oil level low in transaxle. Parking brake engaged or malfunctioning. Electrical problem (eHydro™). (See <u>eHydro™—Forward and Reverse Pedal Sensor Test and Adjustment</u> in Section 40, Group 50.) Failed flex plate coupling between engine and PRT input shaft or Hydrostatic transmission input shaft. Hydrostatic transmission problem. (See <u>Troubleshooting</u> in Section 70, Group 30.) Mechanical failure at range transmission, differential, or final drives.
Range Transmission Hard to Shift or Won't Shift	Hydraulic oil level low in transaxle. Machine not completely stopped when attempting to shift. Hydrostatic transmission not going completely into neutral, keeping pressure on gears. PRT clutch pedal improperly adjusted causing incomplete disengagement, and keeping pressure on gears Mechanical failure inside range transmission, such as bent shift forks or damaged detent shaft or parts.
Differential Lock Does Not Work	Hydraulic oil level low in transaxle. Pedal or linkage problem. Mechanical failure of differential lock fork, slider, or differential.

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SW03989.0000C75 -19-11NOV10-1/1

Final Drive Symptom Diagnosis

Symptom	Problem	Solution
Machine Will Not Move	Hydraulic oil low.	Fill to correct level.
	Parking brake engaged or malfunctioning.	Disengage brake. Parking brake mechanism damaged or needs adjustment.
	Flex plate coupling between engine and hydrostatic input shaft damaged.	Replace flex plate.
	Hydrostatic or PRT unit failed.	Repair or replace components as necessary.
	Electrical problem (eHydro™ only).	Repair or replace components as necessary. (See eHydro™—Forward and Reverse Pedal Sensor Test and Adjustment in Section 40, Group 50.)
	Mechanical failure of range transmission, differential, or final drives.	Repair or replace components as necessary.
Symptom	Problem	Solution
Range Transmission Hard to Shift or Won't Shift	Hydraulic oil level low	Fill to correct level.
	Hydrostatic transmission not going fully into neutral causing machine to creep (Hydro™ only).	Adjust neutral.
	PRT clutch linkage maladjusted causing machine to creep.	Adjust linkage, repair, or replace clutch valve.
	Shift forks, shift arm, detent shaft, or ball damaged.	Repair or replace components as necessary.

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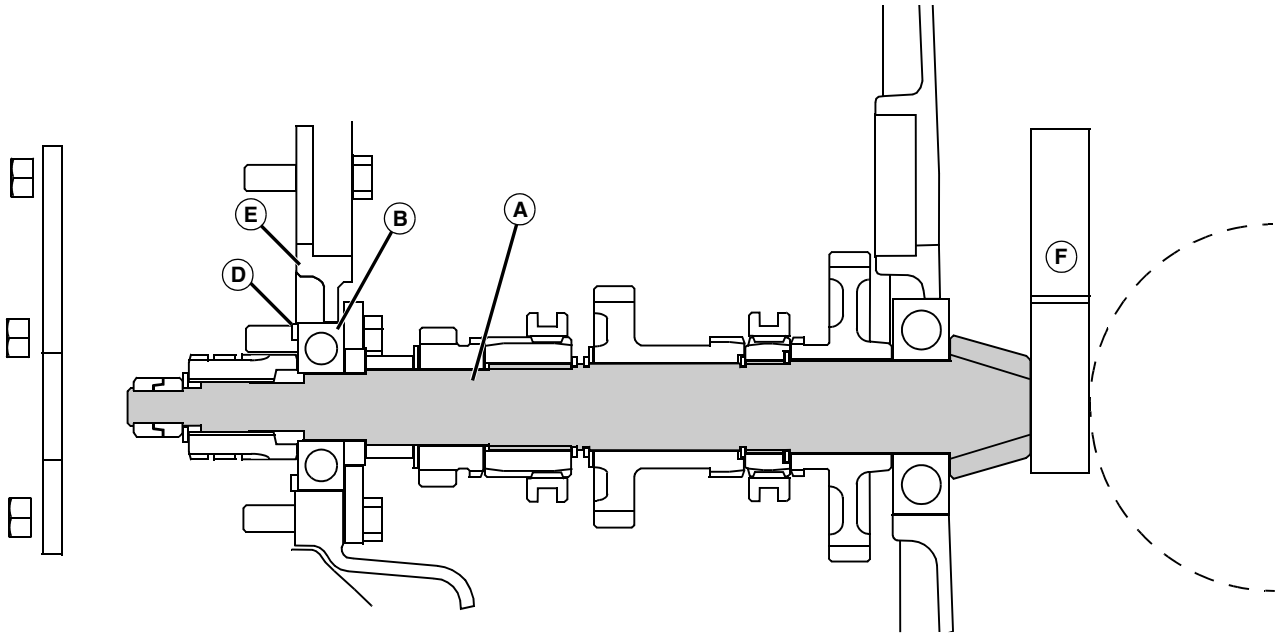
SW03989,0000C76 -19-11NOV10-1/1

Differential Lock Symptom Diagnosis

Symptom	Problem	Solution
Differential Lock Does Not Work	Pedal or link damaged/binding.	Repair or replace components as necessary.
	Mechanical failure of differential lock fork, slider, or differential.	Repair or replace components as necessary.

SW03989,0000C77 -19-05NOV10-1/1

Differential Pinion Shaft Adjustment



A—Pinion Shaft Assembly

B—Bearing
C—Distance

D—Shim
E—Center Plate

F—Block Tool

Reason:

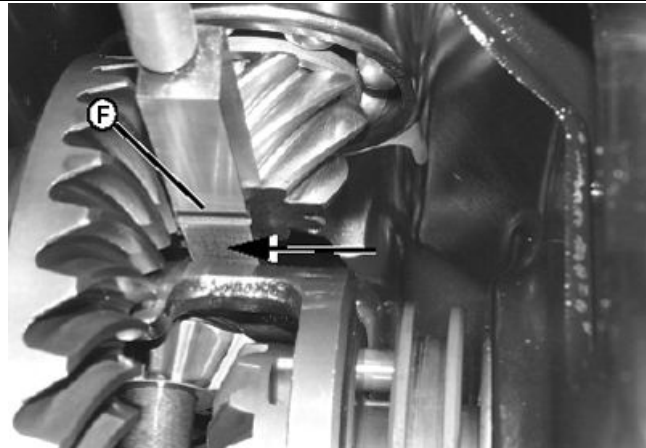
To ensure proper gear engagement.

NOTE: Center plate must be bolted in place with a new gasket and two bolts on each side for accurate measurement.

SW03989,0000C78 -19-05NOV10-1/4

Procedure:

1. Install pinion shaft assembly (A). Do not install outer bearing retainer plate.
2. Install center plate gasket and center plate (E). Install a few bolts on each side of center plate to clamp center plate to proper position.
3. Turn differential assembly to align closed portion of differential housing with pinion shaft. Place 15.5 mm (0.610 in.) block tool (F) in space between end of pinion shaft and differential housing. Make sure tool is also against ring gear. This positions tool on largest machined portion of differential housing closest to ring gear. Seat pinion shaft assembly, including bearing (B) firmly against block.
4. Place a straight edge (G) across the face of the center plate.



F—Block Tool

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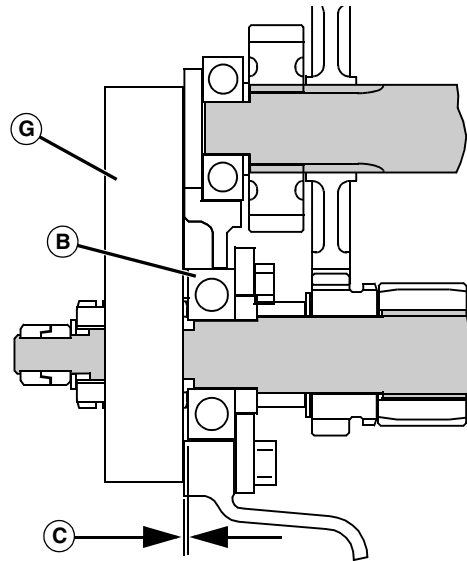
SW03989,0000C78 -19-05NOV10-2/4

5. Measure the distance (C) between the straight edge (face of center plate) and the bearing face.
6. Based on the value of the measurement, refer to table to determine the adjustment shim to use.

Dimension		Number of Shims
2.2 mm	0.087 in.	1
2.3 mm	0.091 in.	1
2.4 mm	0.94 in.	1
2.5 mm	0.98 in.	1
2.6 mm	0.102 in.	1
2.7 mm	0.106 in.	1
2.8 mm	0.110 in.	1
2.9 mm	0.114 in.	1
3.0 mm	0.118 in.	1

B—Bearing
C—Distance

G—Straight Edge



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SW03989,0000C78 -19-05NOV10-3/4

NOTE: Adjustment shim washers are available in 0.1 mm (0.004 in.) size differences. Use closest shim washer to measurement.

7. Install shim (D) and retainer plate (H).

NOTE: Apply thread lock compound to nuts and cap screws before installation.

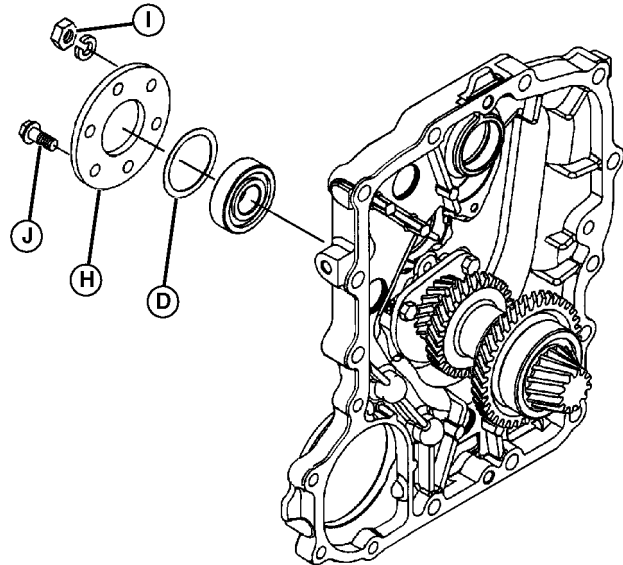
8. Install cap screws (J). Tighten to specification.
9. Install lock washers and nuts (I). Tighten to specification.

Specification

M10 Cap Screw and
Nut—Torque..... 44—59 N·m (33—43 lb.-ft.)

D—Shim
H—Retainer Plate

I— Lock Washer and Nut (3 used)
J— Cap Screw (3 used)



LVAL12296—UN—29OCT10

SW03989,0000C78 -19-05NOV10-4/4

Differential Backlash Adjustment

Reason:

To place the differential ring gear in proper relationship with the differential pinion shaft.

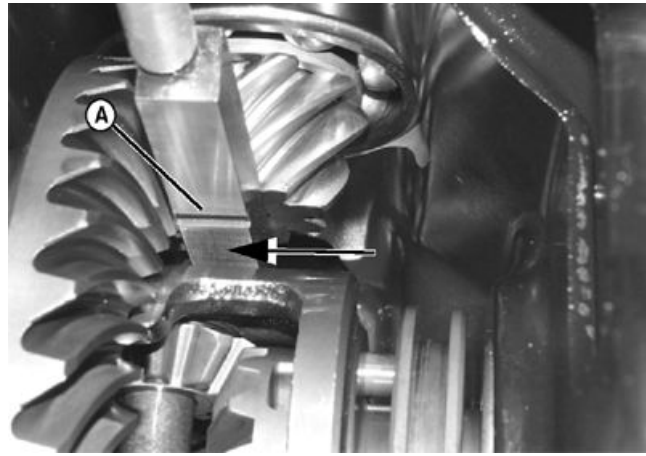
IMPORTANT: Avoid Damage! Always check and adjust backlash after pinion shaft adjustment has been made. Adjust backlash when the gearset or bearings were replaced or the amount of shims are in question.

Procedure:

1. While slowly rotating the differential housing carrier, use a soft faced mallet to lightly tap the face of the ring gear to move it and the carrier toward the left-side bearing cover.

NOTE: This is to ensure that the carrier and bearing are seated against the shim.

2. Set up a dial indicator to measure ring gear (A) movement.
3. While holding the differential pinion shaft stationary at the pinion, rotate the ring gear back and forth and note the backlash reading on the dial indicator.



A—Ring Gear

Specification

Differential Ring Gear—Backlash.....0.1—0.2 mm (0.004—0.008 in.)

SW03989,0000C79 -19-11NOV10-1/3

To Adjust Backlash:

1. If not already off, remove left axle housing. (See [Differential Removal and Installation](#) in Section 80, Group 40.)
2. Remove and measure thickness of shim (B) located inside bearing cover. Install thinner shim to increase backlash, or install thicker shim to decrease backlash.

NOTE: Refer to Table to determine the shim(s) to use.

Dimension		Number of Shims
2.0 mm	0.079 in.	1
2.1 mm	0.083 in.	1
2.2 mm	0.87 in.	1
2.3 mm	0.91 in.	1
2.4 mm	0.094 in.	1
2.5 mm	0.098 in.	1
2.6 mm	0.102 in.	1



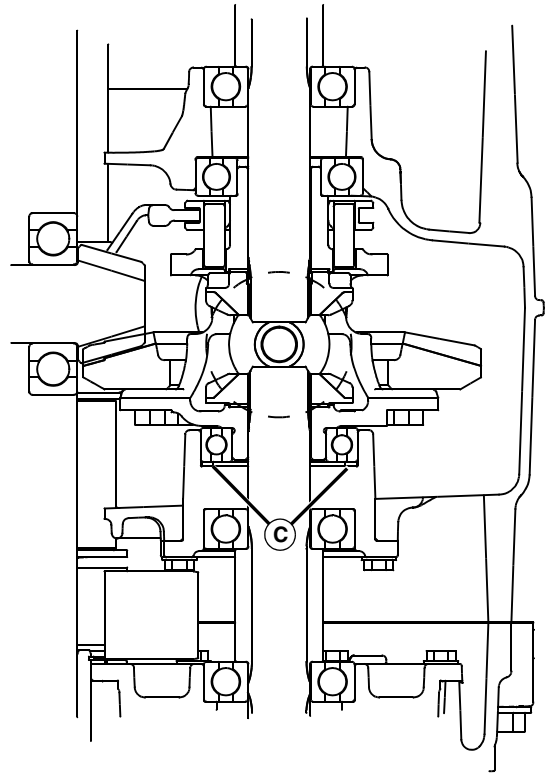
B—Shim(s)

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SW03989,0000C79 -19-11NOV10-2/3

3. Install differential carrier and recheck backlash after removing or installing shims (C).

C—Shim(s)



LVAL12299 —UN—29OCT10

SW03989,0000C79 -19-11NOV10-3/3

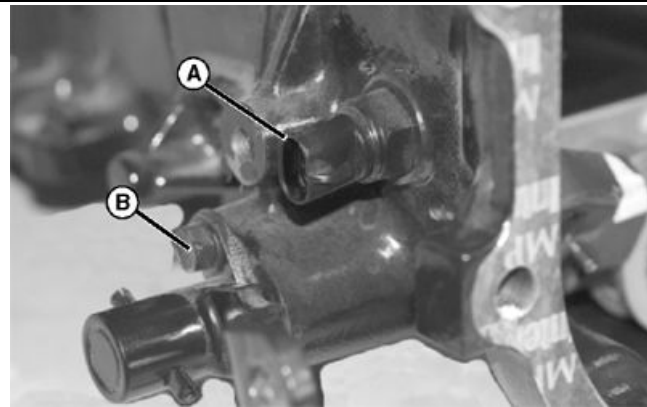
MFWD Output Shaft

Removal:

1. Split machine at rear of tunnel. See Splitting Machine (Rear) in the appropriate power train section for the machine. (i.e. Hydrostatic Power Train or PowrReverser™ Power Train)
2. Unscrew and remove MFWD switch (A).
3. Remove cap screw and keeper plate (B).

A—MFWD Switch

B—Cap Screw and Keeper
Plate



MFWD Switch Removal

LVAL12313—UN—29OCT10

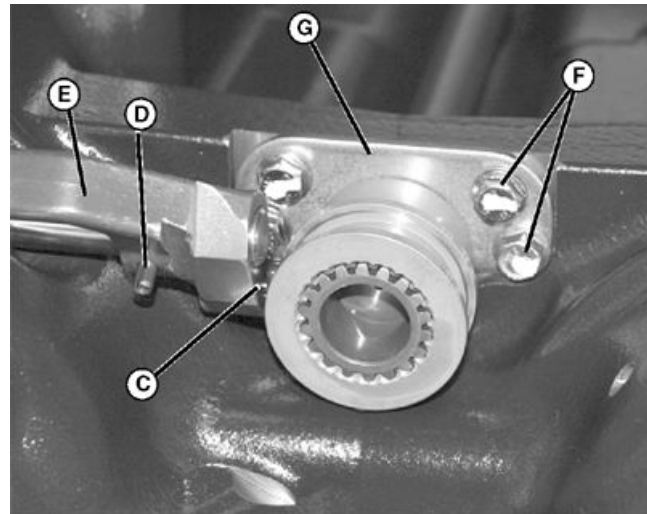
PowrReverser is a trademark of Deere & Company

SW03989,0000C7A -19-05NOV10-1/14

4. Slide shift shaft out far enough to remove shift arm shoe (C).
5. Remove roll pin (D) and slide shaft out and remove shift arm (E).
6. Remove four bolts (F) on keeper plate (G).

C—Shift Arm Shoe
D—Roll Pin
E—Shift Arm

F—Bolts (4 used)
G—Keeper Plate

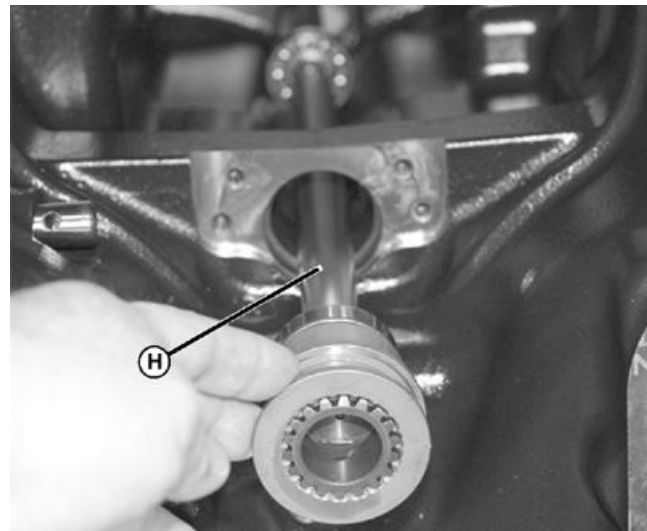


LVAL12301—UN—29OCT10

SW03989,0000C7A -19-05NOV10-2/14

7. Pull shaft assembly (H) out of tunnel.

H—Shaft Assembly



LVAL12302—UN—29OCT10

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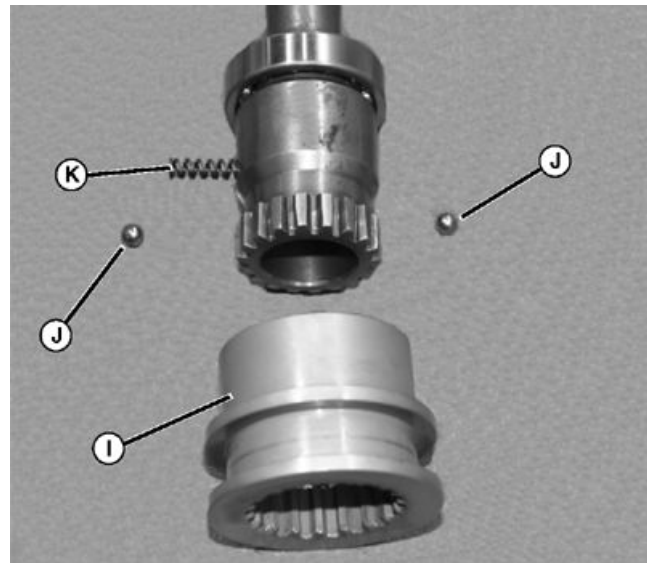
SW03989,0000C7A -19-05NOV10-3/14

Disassembly:

NOTE: Front drive shaft has two spring loaded detent balls located under shift collar (I). Place collar in a box or wrap with shop cloth when removing to avoid losing parts. Use care when removing shift collar from shaft.

1. Remove shift collar (I), detent balls (J), spring (K) from front drive shaft.

I— Shift Collar
J— Detent Ball (2 used)
K—Spring

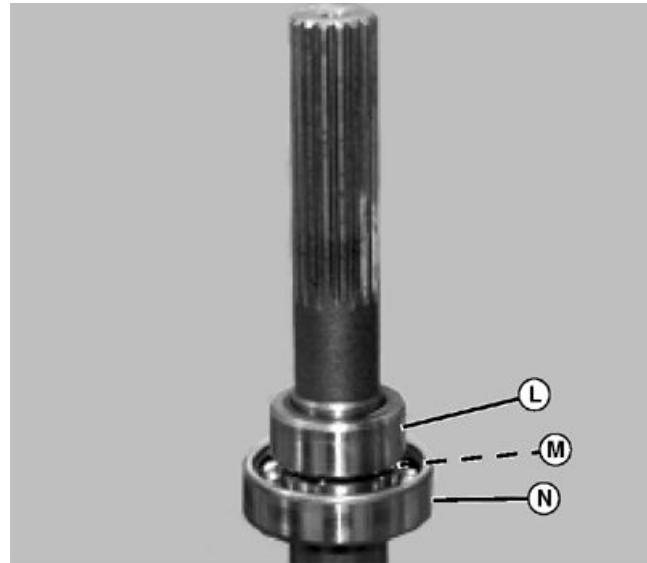


LVAL 12303 —UN—29OCT10

SW03989,0000C7A -19-05NOV10-4/14

2. Remove seal collar (L), snap ring (M), and bearing (N).

L— Seal Collar
M—Snap Ring
N—Bearing



LVAL 12304 —UN—29OCT10

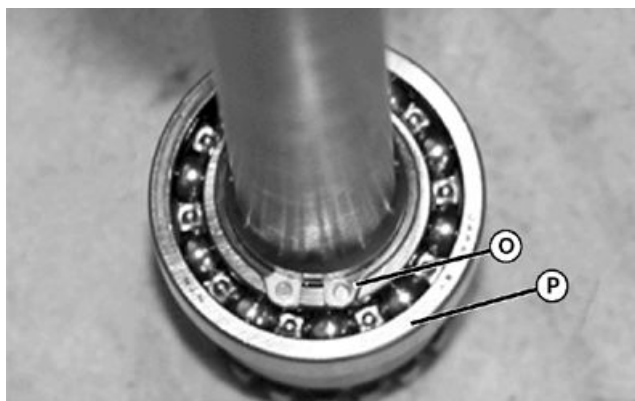
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SW03989,0000C7A -19-05NOV10-5/14

3. Remove snap ring (O), and bearing (P).

IMPORTANT: Avoid Damage! DO NOT spin bearing using compressed air. Damage to bearing balls, cage, and races could result.

4. Clean all parts. Inspect bearings for discolored, burned balls and/or races. Check balls and races for spalling or cracking. Roll bearing by hand to check for rough turning or excessive looseness or play between balls and races. Replace bearings as required.
5. Inspect bearing surfaces on shaft for wear or damage.
6. Inspect spines on front drive shaft and shift collar for damaged splines.
7. Inspect groove in shift collar for scoring or damage. Replace any worn or damaged parts.



O—Snap Ring

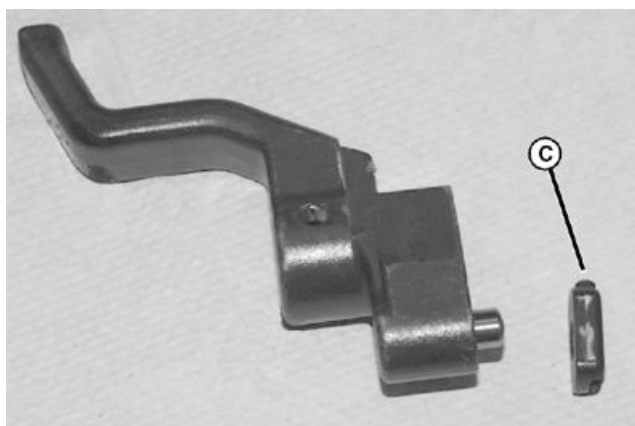
P—Bearing

SW03989,0000C7A -19-05NOV10-6/14

LVAL12305—UN—29OCT10

8. Inspect shift arm shoe (C) for wear. Replace as required.

C—Shift Arm Shoe

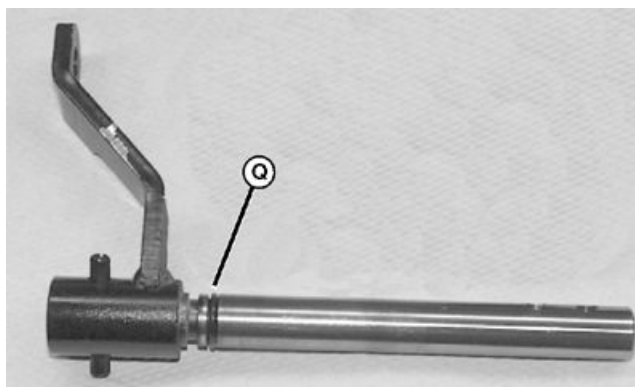


SW03989,0000C7A -19-05NOV10-7/14

LVAL12306—UN—29OCT10

9. Replace O-ring (Q) on shift shaft before assembly.

Q—O-ring



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SW03989,0000C7A -19-05NOV10-8/14

LVAL12307—UN—29OCT10

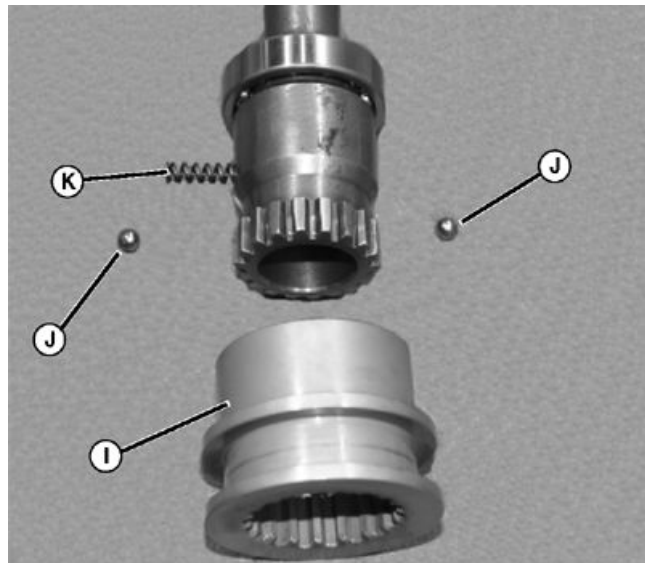
Assembly:

1. Apply grease to detent balls (J) and spring (K) to help hold them in place during assembly. Assemble spring, detent balls, and shift collar (I) on front drive shaft. Install shift collar with groove toward gear side as shown.

I— Shift Collar

K—Spring

J— Detent Ball (2 used)



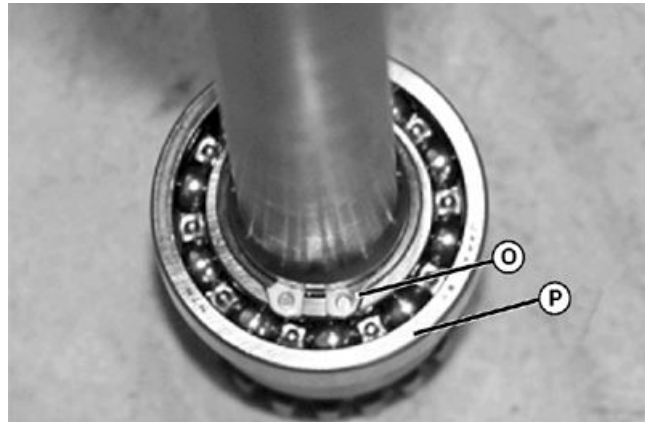
LVAL12308 —UN—29OCT10

SW03989,0000C7A -19-05NOV10-9/14

2. Install bearing (P) and snap ring (O).

O—Snap Ring

P—Bearing



LVAL12309 —UN—29OCT10

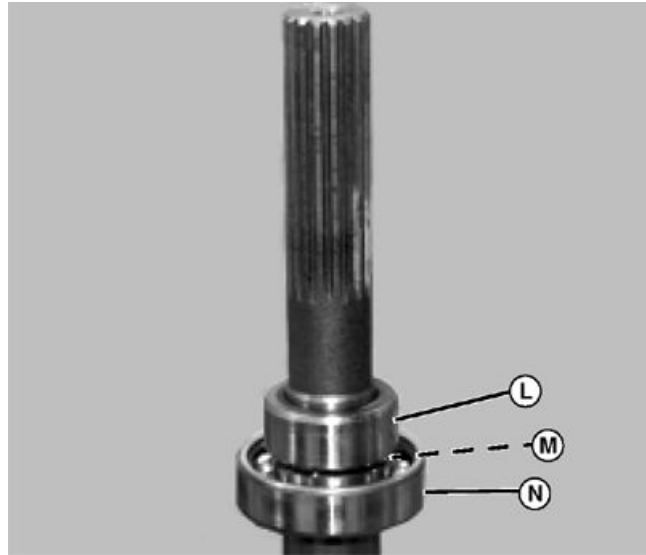
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SW03989,0000C7A -19-05NOV10-10/14

3. Install bearing (N), snap ring (M), and new seal collar (L).

L—Seal Collar
M—Snap Ring

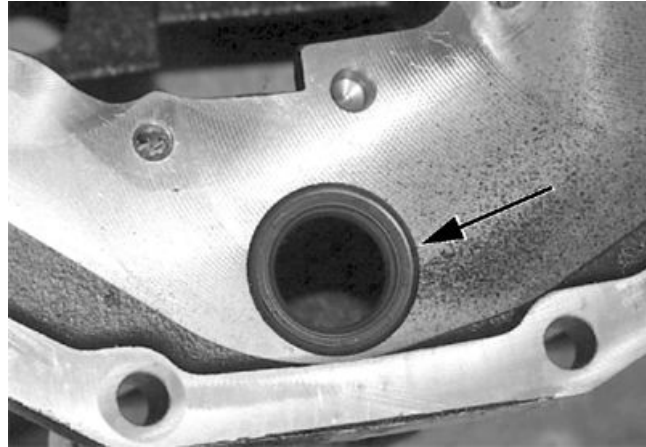
N—Bearing



LVAL12310 —UN—29OCT10

SW03989,0000C7A -19-05NOV10-11/14

4. Install new oil seal in tunnel.
5. Install shaft assembly into tunnel using care not to damage oil seal.



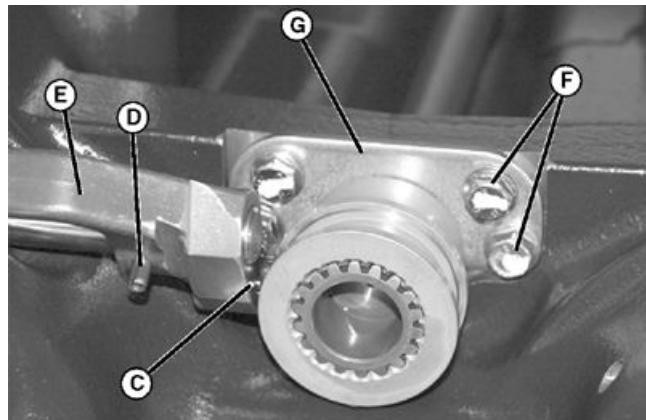
LVAL12311 —UN—29OCT10

SW03989,0000C7A -19-05NOV10-12/14

6. Install keeper plate (G). Apply Loctite to bolts (F) and install.
7. Install shift arm shoe (C) on shift arm (E).
8. Slide shift shaft into shift arm. Align holes and retain with roll pin (D).

C—Shift Arm Shoe
D—Roll Pin
E—Shift Arm

F—Bolts (4 used)
G—Keeper Plate



LVAL12312 —UN—29OCT10

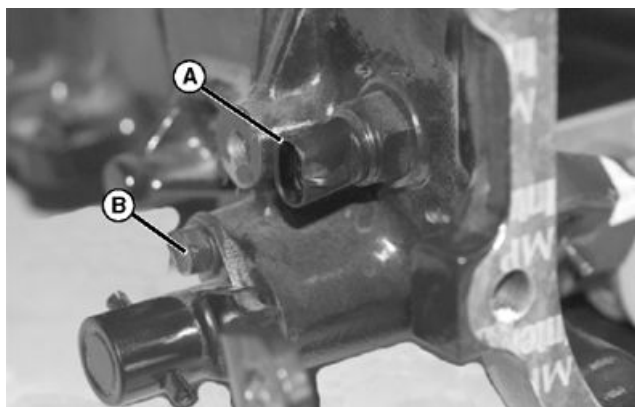
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SW03989,0000C7A -19-05NOV10-13/14

9. Install MFWD switch (A), cap screw and keeper plate (B).

A—MFWD Switch

B—Cap Screw and Keeper Plate



LVAL12313—UN—29OCT10

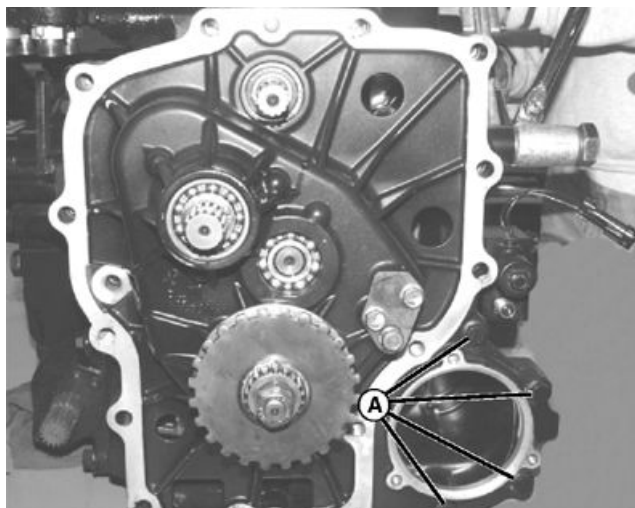
SW03989,0000C7A -19-05NOV10-14/14

Speed Range Transmission (eHydro™)

Removal:

1. Split machine at rear of tunnel. See Splitting Machine (Rear) in the appropriate power train section for the machine. (eHydro™ Power Train or PowrReverser™ Power Train).
2. Remove rockshaft. (See Rockshaft Removal and Installation in Section 90, Group 35.)
3. Remove the four remaining bolts (A) from range transmission cover.

A—Bolt (4 used)



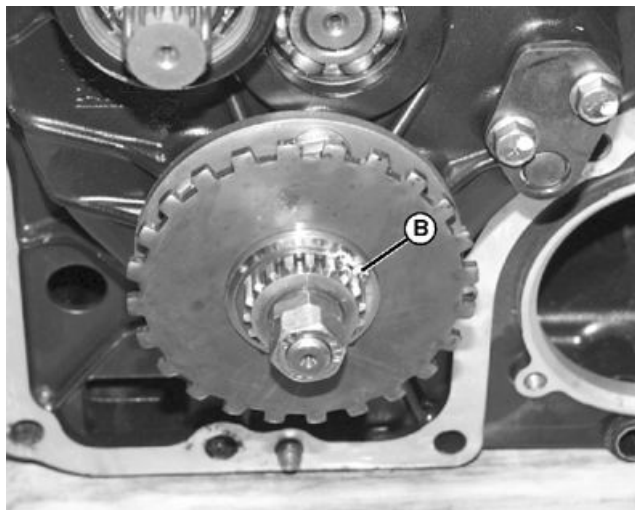
LVAL12314—UN—29OCT10

*eHydro is a trademark of Deere & Company
PowrReverser is a trademark of Deere & Company*

SW03989,0000C7B -19-11FEB11-1/38

4. Remove snap ring (B) from pinion shaft.

B—Snap Ring



LVAL12315—UN—29OCT10

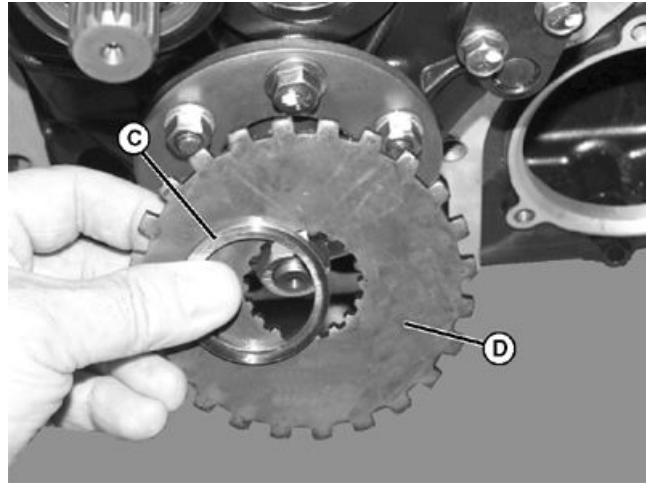
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SW03989,0000C7B -19-11FEB11-2/38

5. Remove spacer (C) and speed sensor gear (D).

C—Spacer

D—Speed Sensor Gear



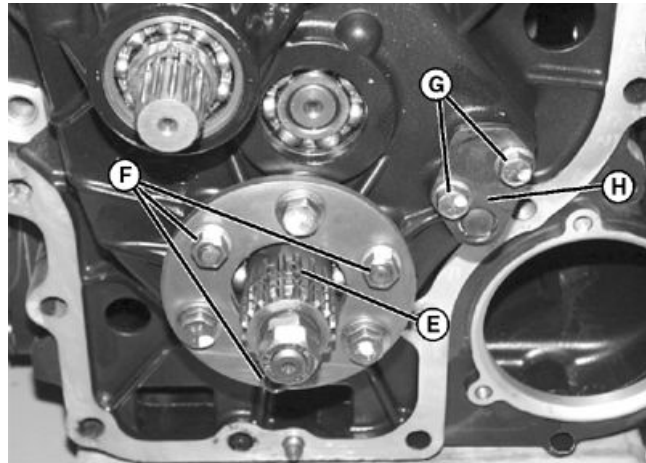
LVAL12316—UN—29OCT10

SW03989,0000C7B -19-11FEB11-3/38

6. Remove remaining snap ring (E) from pinion shaft.
7. Remove three nuts (F) from bearing retainer plate.
8. Remove bolts (G) and detent ball cover (H).

E—Snap Ring
F—Nut (3 used)

G—Bolt (2 used)
H—Detent Ball Cover



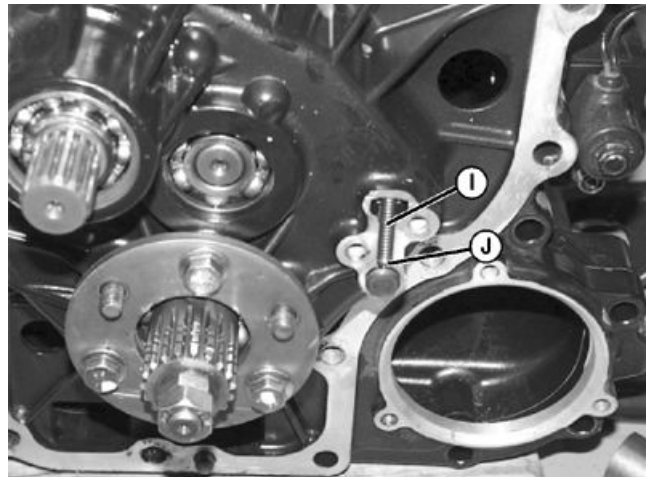
LVAL12317—UN—29OCT10

SW03989,0000C7B -19-11FEB11-4/38

9. Remove spring (I) and detent ball (J).

I—Spring

J—Detent Ball



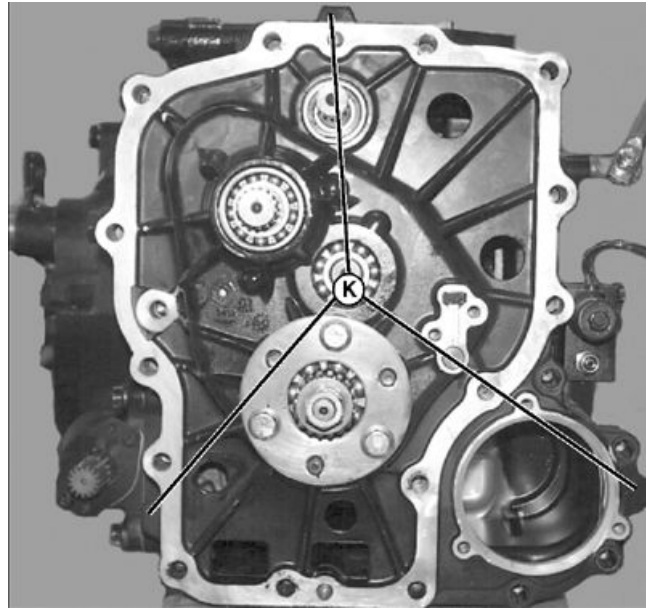
LVAL12318—UN—29OCT10

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SW03989,0000C7B -19-11FEB11-5/38

10. Alternately tap on the tabs (K) to remove transmission cover. As the cover comes forward, tap the shafts in to keep them in place in the main housing. Remove the transmission cover.

K—Tabs



LVAL12319 —UN—29OCT10

SW03989,0000C7B -19-11FEB11-6/38

Disassembly:

1. Remove bolt and keeper (A) from range shift shaft.

A—Bolt and Keeper



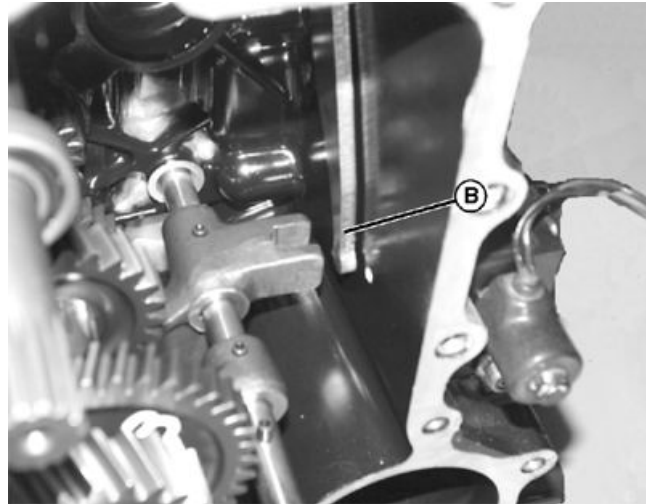
LVAL12320 —UN—29OCT10

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SW03989,0000C7B -19-11FEB11-7/38

2. Slide shift lever (B) out toward case to disengage from shift fork.

B—Shift Lever

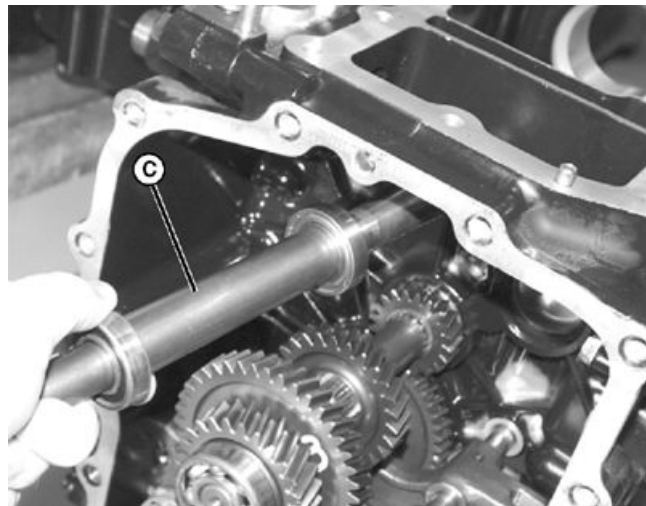


LVAL12321—UN—29OCT10

SW03989,0000C7B -19-11FEB11-8/38

3. Remove PTO shaft (C).

C—PTO Shaft

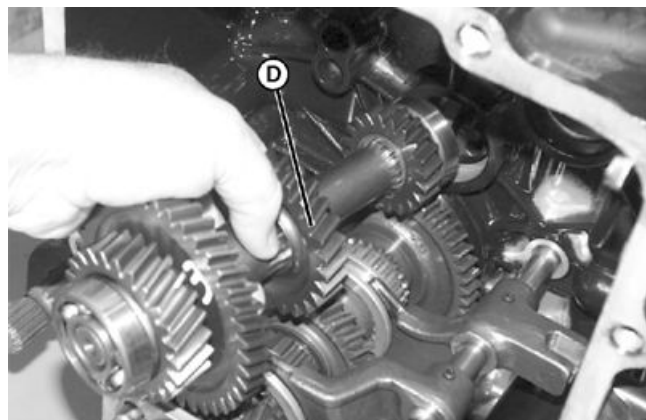


LVAL12322—UN—29OCT10

SW03989,0000C7B -19-11FEB11-9/38

4. Slide pinion shaft out slightly and then remove reduction shaft (D).

D—Reduction Shaft



LVAL12323—UN—29OCT10

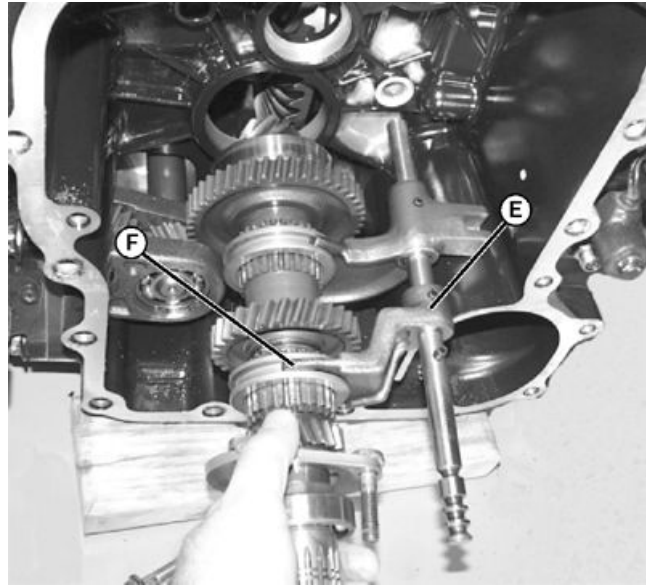
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SW03989,0000C7B -19-11FEB11-10/38

5. Remove pinion shaft (F) and shift shaft (E) together.

E—Shift Shaft

F—Pinion Shaft

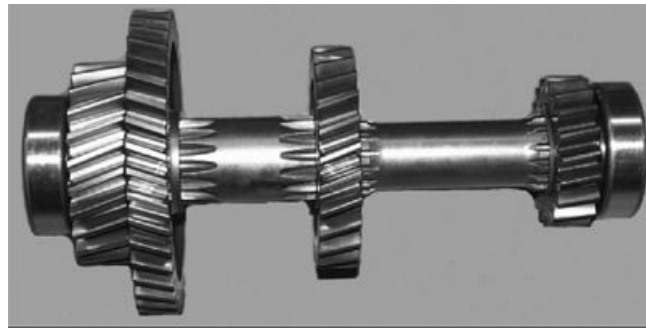


LVAL12324—UN—29OCT10

SW03989,0000C7B -19-11FEB11-11/38

Driven Shaft Disassembly:

1. Inspect all gears on driven shaft for worn or broken teeth. Check bearings for wear or damage.



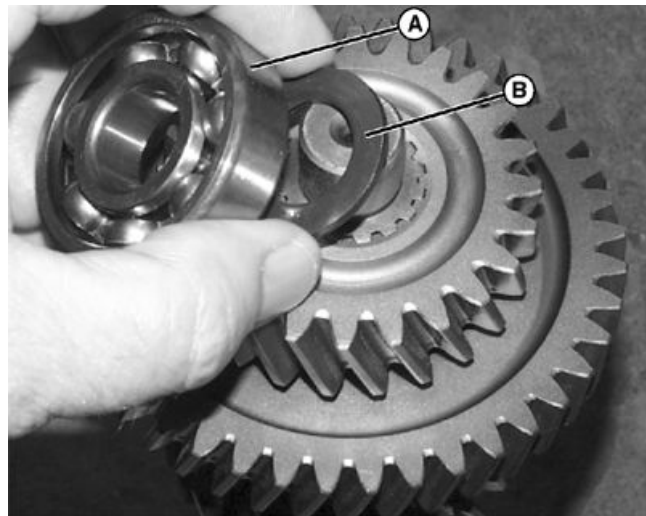
LVAL12325—UN—29OCT10

SW03989,0000C7B -19-11FEB11-12/38

2. Remove bearing (A) and washer (B).

A—Bearing

B—Washer



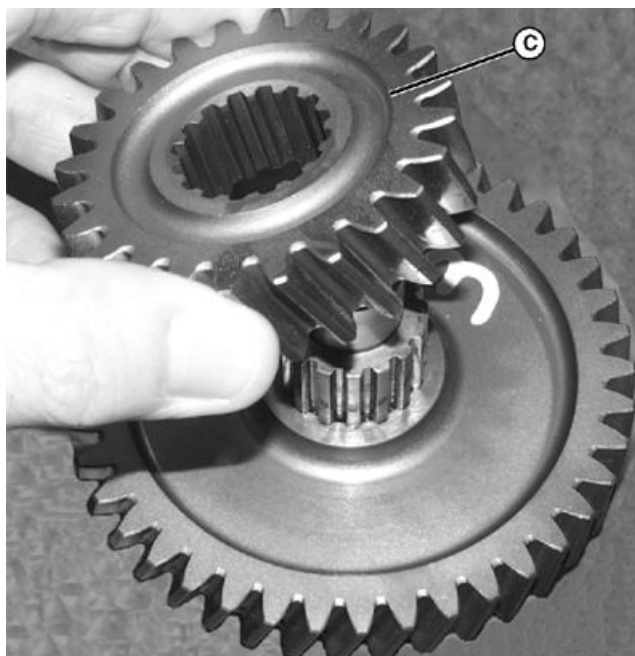
LVAL12326—UN—29OCT10

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SW03989,0000C7B -19-11FEB11-13/38

3. Remove 24T gear (C).

C—Gear, 24T

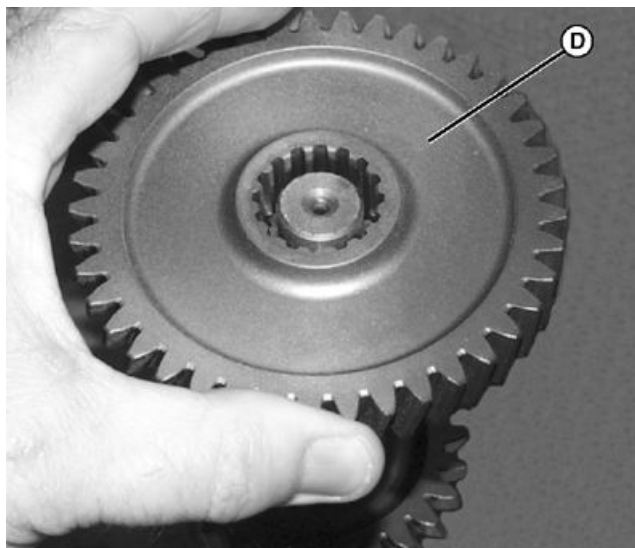


LVAL12327 —UN—29OCT10

SW03989,0000C7B -19-11FEB11-14/38

4. Remove 41T gear (D).

D—Gear, 41T



LVAL12328 —UN—29OCT10

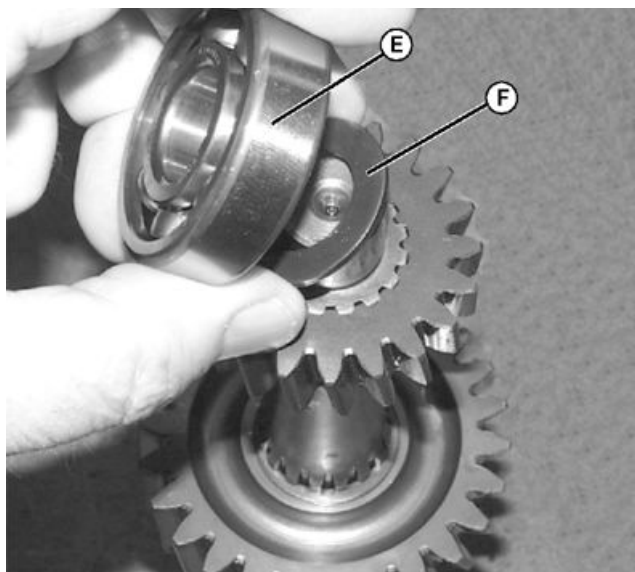
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SW03989,0000C7B -19-11FEB11-15/38

5. Remove bearing (E) and washer (F).

E—Bearing

F—Washer



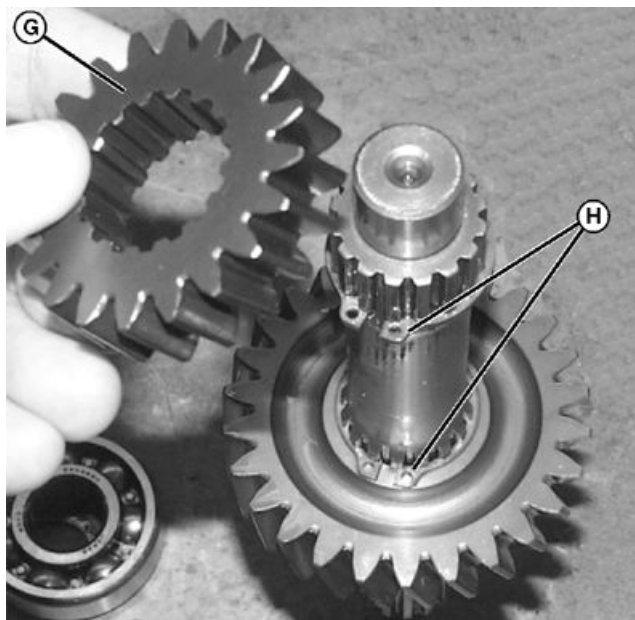
LVAL12329—UN—29OCT10

SW03989,0000C7B -19-11FEB11-16/38

6. Remove 20T gear (G) and two snap rings (H).

G—Gear, 20T

H—Snap Ring (2 used)



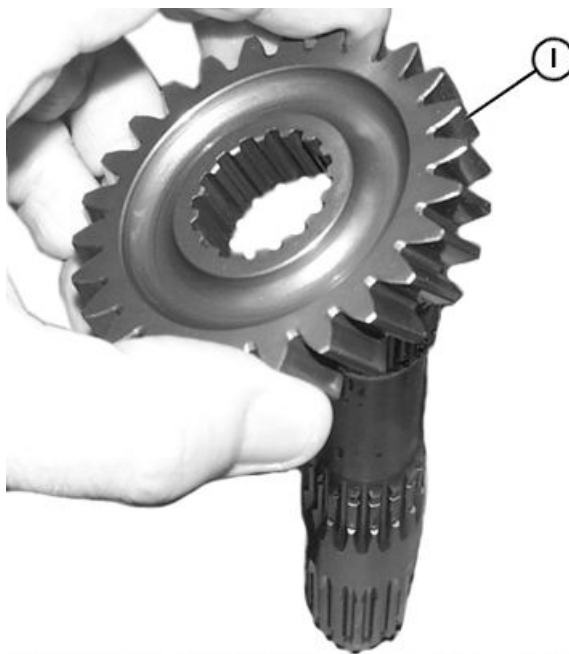
LVAL12330—UN—29OCT10

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SW03989,0000C7B -19-11FEB11-17/38

7. Remove 26T gear (I).

I— Gear, 26T



26T Gear Removal From Driven Shaft

LVAL13887 —UN—17DEC10

SW03989,0000C7B -19-11FEB11-18/38

IMPORTANT: Avoid Damage! DO NOT spin bearing using compressed air. Damage to bearing balls, cage, and races could result.

8. Clean all parts in solvent. Dry with compressed air.
9. Inspect bearings for discolored, burned, balls and/or races. Check balls and races for spalling or cracking. Roll bearing by hand to check for rough turning or excessive looseness or play between balls and races. Replace bearings as required.
10. Inspect spines and gear teeth on all gears and driven shaft assembly for wear or damage. Replace as required.

LVAL12332 —UN—29OCT10



Assembly:

- Assemble in the reverse order of disassembly.

Continued on next page

SW03989,0000C7B -19-11FEB11-19/38

Pinion Shaft Disassembly:

1. Remove shift fork and shaft assembly (A) from pinion shaft.

A—Shift Fork and Shaft Assembly



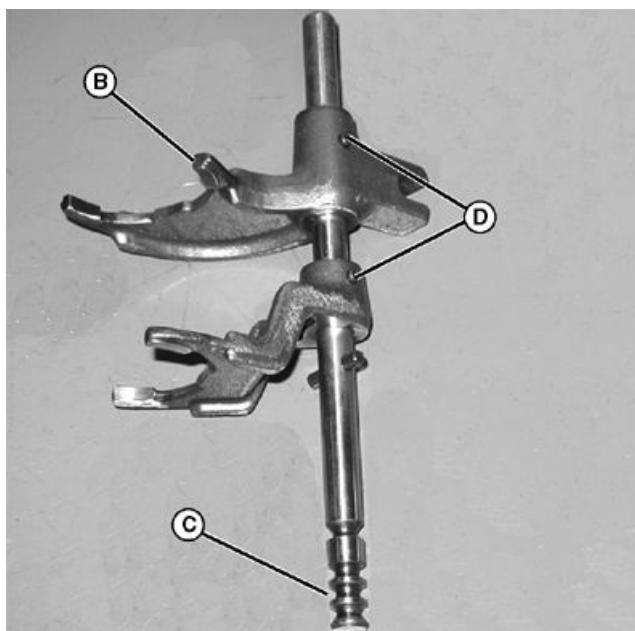
LVAL12333 —UN—29OCT10

SW03989,0000C7B -19-11FEB11-20/38

2. Inspect fork ends for excessive wear or bending. Check detent grooves (C) for wear or damage. If fork removal is necessary, drive out roll pins (D) with a punch and remove/replace forks as needed.

B—Shift Fork (2 used)
C—Detent Grooves

D—Roll Pin (2 used)



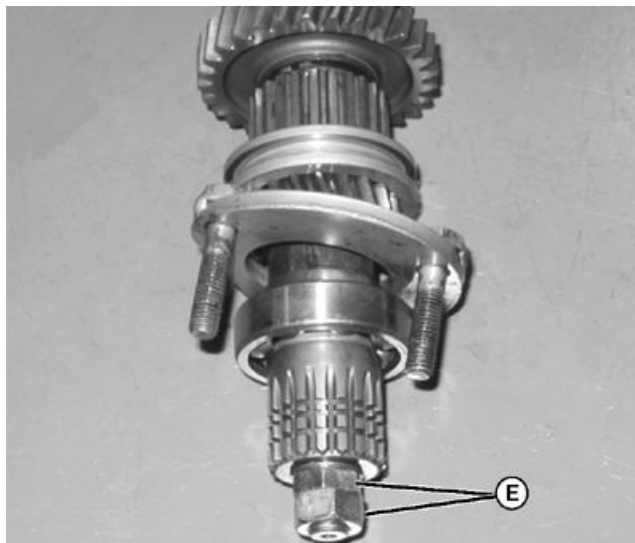
LVAL12334 —UN—29OCT10

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SW03989,0000C7B -19-11FEB11-21/38

- Using two wrenches, loosen outer and inner locking nuts (E).

E—Locking Nut (2 used)

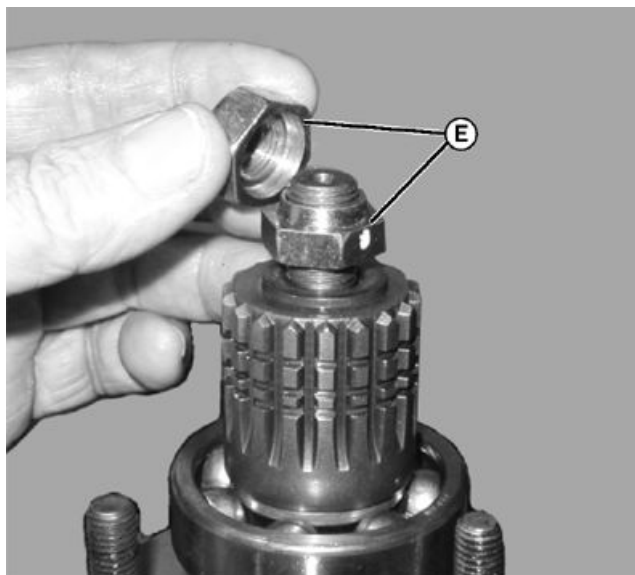


LVAL12335 —UN—29OCT10

SW03989,0000C7B -19-11FEB11-22/38

- Remove locking nuts (E). Note the difference between inner and outer nut.

E—Locking Nut (2 used)



LVAL12336 —UN—29OCT10

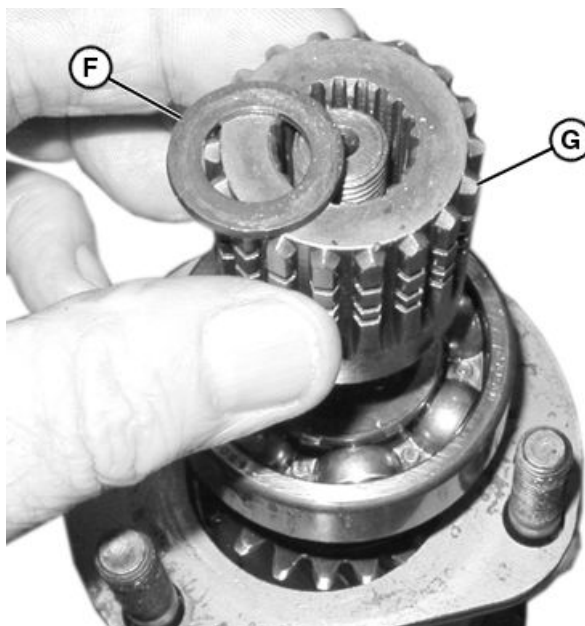
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SW03989,0000C7B -19-11FEB11-23/38

5. Remove washer (F) and splined collar (G).

F—Washer

G—Splined Collar



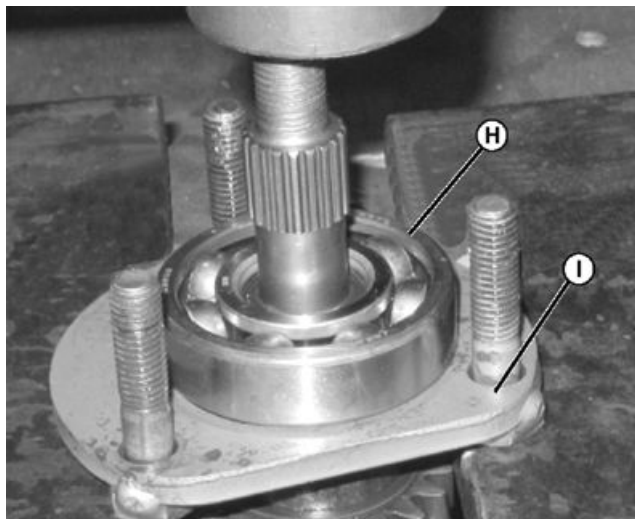
LVAL13888 —UN—17DEC10

SW03989,0000C7B -19-11FEB11-24/38

6. Remove bearing (H) and retainer (I) with a press.

H—Bearing

I— Retainer



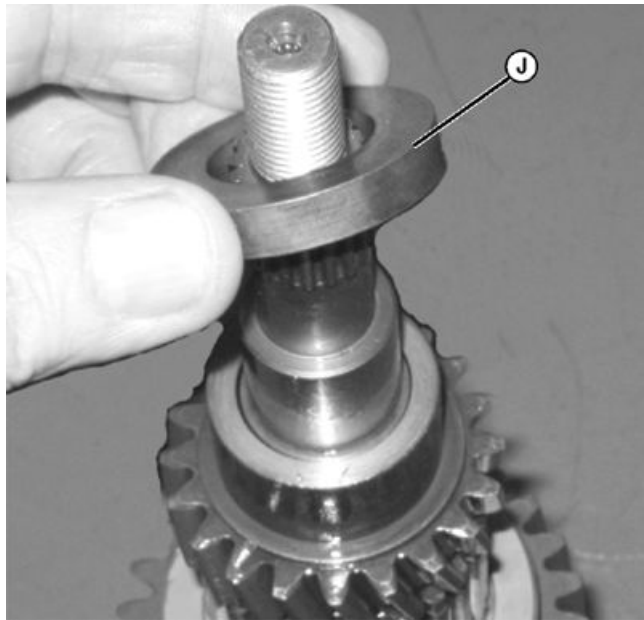
LVAL12338 —UN—09NOV10

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SW03989,0000C7B -19-11FEB11-25/38

7. Remove washer (J).

J—Washer

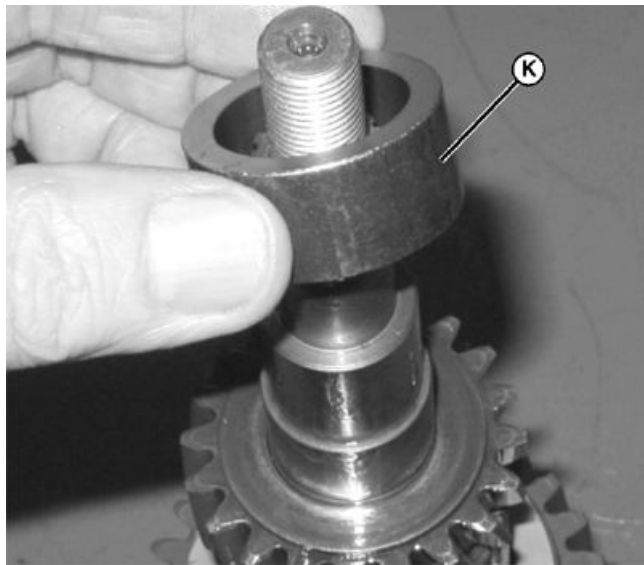


LVAL12339 —UN—29OCT10

SW03989,0000C7B -19-11FEB11-26/38

8. Remove spacer (K).

K—Spacer



LVAL12340 —UN—29OCT10

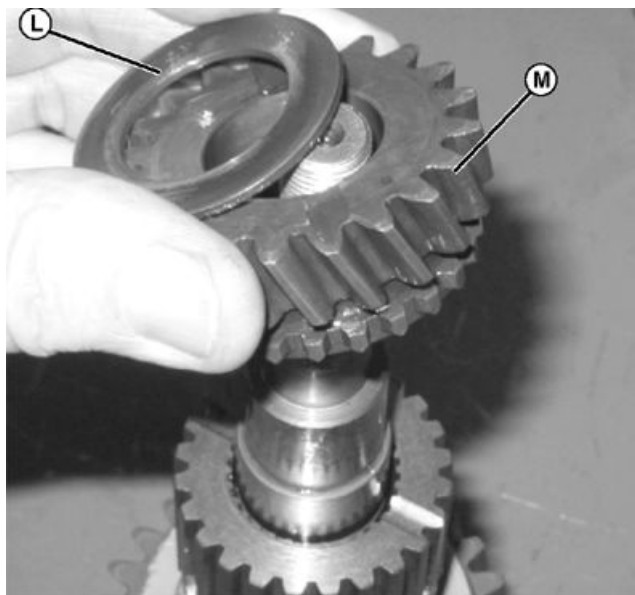
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SW03989,0000C7B -19-11FEB11-27/38

9. Remove washer (L) and 20T gear (M).

L—Washer

M—Gear, 20T



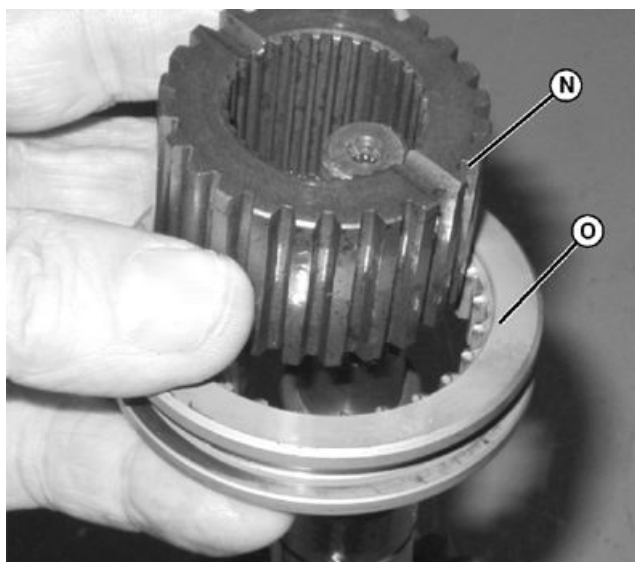
LVAL12341 —UN—29OCT10

SW03989,0000C7B -19-11FEB11-28/38

10. Remove splined collar (N) and shift collar (O).

N—Splined Collar

O—Shift Collar



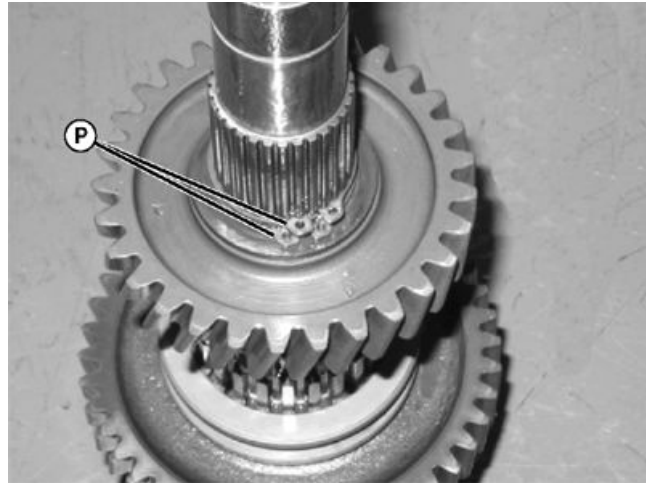
LVAL12342 —UN—29OCT10

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SW03989,0000C7B -19-11FEB11-29/38

11. Remove two snap rings (P).

P—Snap Ring (2 used)



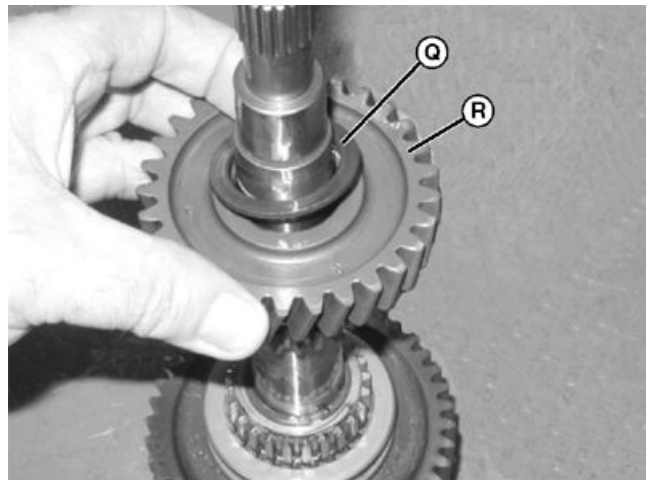
LVAL12343 —UN—29OCT10

SW03989,0000C7B -19-11FEB11-30/38

12. Remove washer (Q) and 29T gear (R).

Q—Washer

R—Gear, 29T

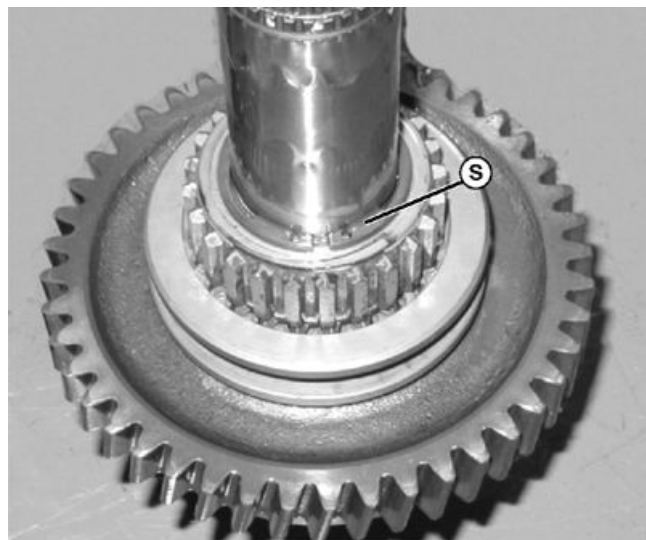


LVAL12344 —UN—29OCT10

SW03989,0000C7B -19-11FEB11-31/38

13. Remove snap ring (S).

S—Snap Ring



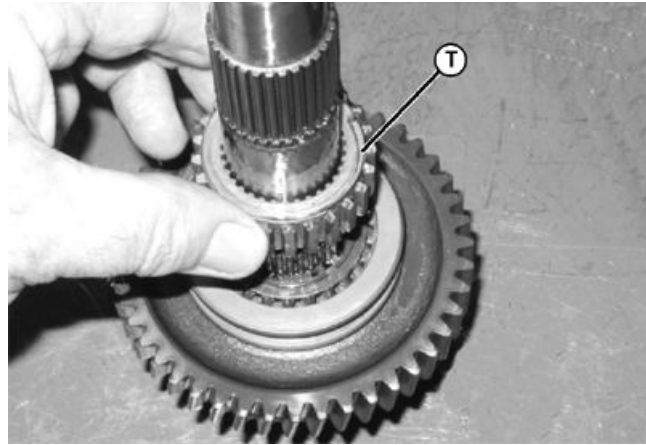
LVAL12345 —UN—29OCT10

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SW03989,0000C7B -19-11FEB11-32/38

14. Remove splined collar (T).

T—Splined Collar

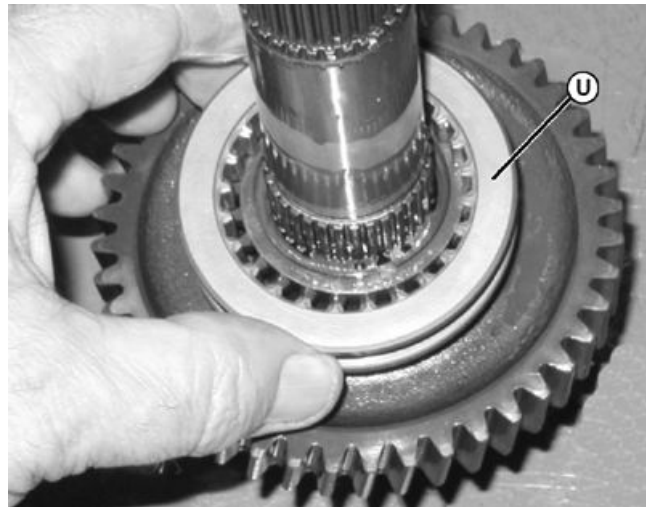


LVAL12346 —UN—29OCT10

SW03989,0000C7B -19-11FEB11-33/38

15. Remove shift collar (U).

U—Shift Collar

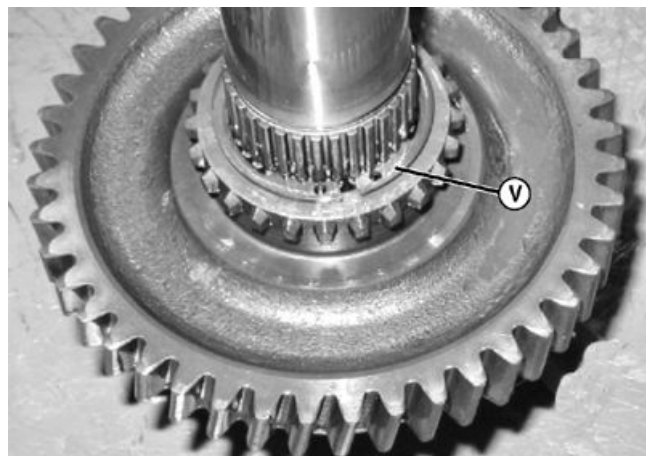


LVAL12347 —UN—29OCT10

SW03989,0000C7B -19-11FEB11-34/38

16. Remove snap ring (V).

V—Snap Ring



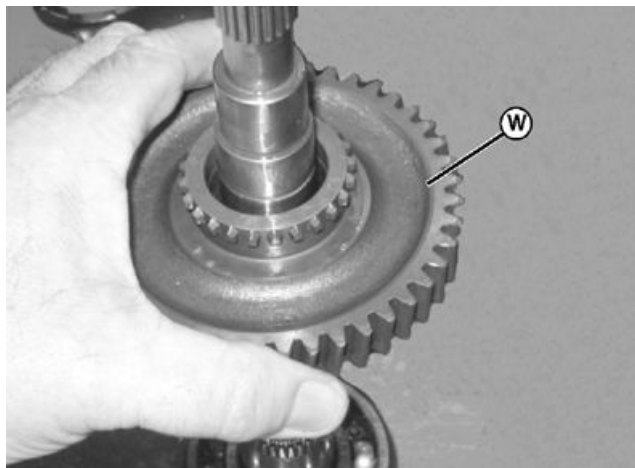
LVAL12348 —UN—29OCT10

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SW03989,0000C7B -19-11FEB11-35/38

17. Remove 44T gear (W).

W—Gear, 44T



LVAL12349 —UN—29OCT10

SW03989,0000C7B -19-11FEB11-36/38

18. Inspect bearing (X). If bearing needs replacement, remove bearing in a press.

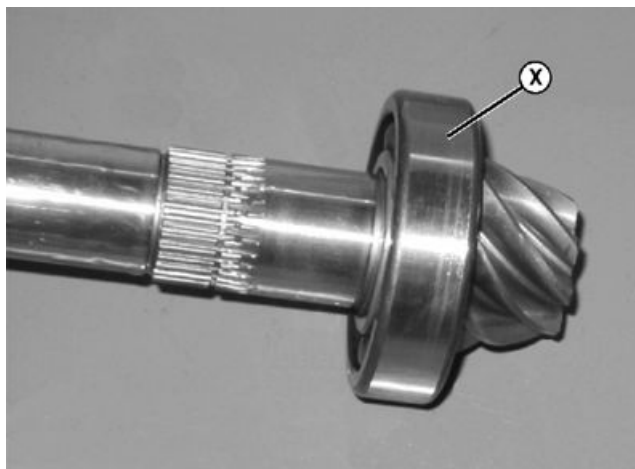
IMPORTANT: Avoid Damage! DO NOT spin bearing using compressed air. Damage to bearing balls, cage, and races could result.

19. Clean all parts. Inspect bearings for discolored, burned balls and/or races. Check balls and races for spalling or cracking. Roll bearing by hand to check for rough turning or excessive looseness or play between balls and races. Replace bearings as required.

20. Inspect all gears for wear or damage. Examine all gear teeth as well as splines on the inside or gear bore if applicable. Replace any worn or damaged parts.

NOTE: Pinion gear and differential ring gear are sold as a set and cannot be replaced individually.

21. Inspect pinion shaft for wear or damage. Inspect all splines and gear teeth. Inspect bearing areas of shaft. Replace pinion shaft and differential ring gear as a set if worn or damaged.



X—Bearing

LVAL12350 —UN—29OCT10

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SW03989,0000C7B -19-11FEB11-37/38

Assembly:

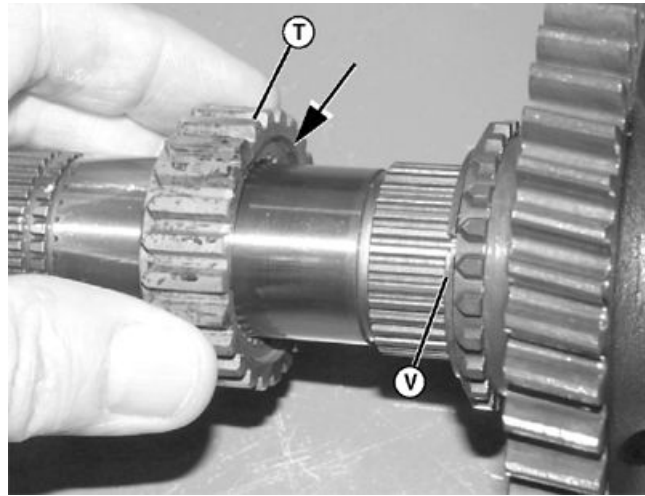
- Parts are assembled in the reverse order of disassembly.
- Coat parts with clean J20C oil during assembly
- Install splined collar (T) with cutout area (arrow) toward snap ring (V).
- Assemble the rest of the parts in the reverse order of disassembly.
- Tighten eccentric inner lock nut (thin nut) and outer nut (thick nut) to specification.

Specification

Eccentric Lock
Nut—Torque..... 78—97 N·m (58—72 lb.-ft.)

T—Splined Collar

V—Snap Ring



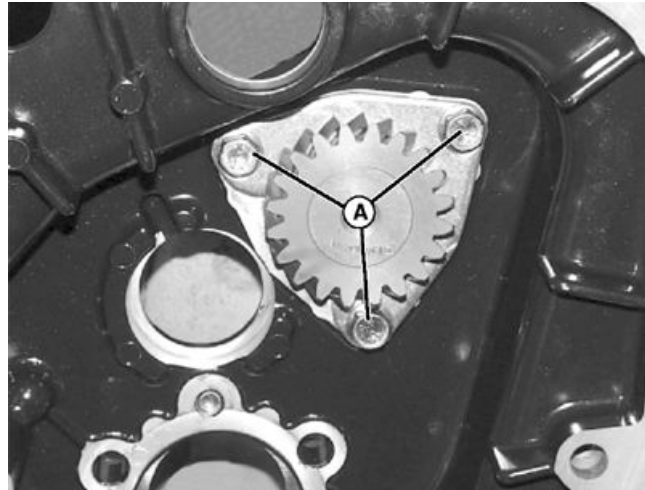
LVAL12351 —UN—29OCT10

SW03989,0000C7B -19-11FEB11-38/38

Main Gear Disassembly/Assembly

1. Remove three bolts (A) from keeper plate.

A—Bolt (3 used)



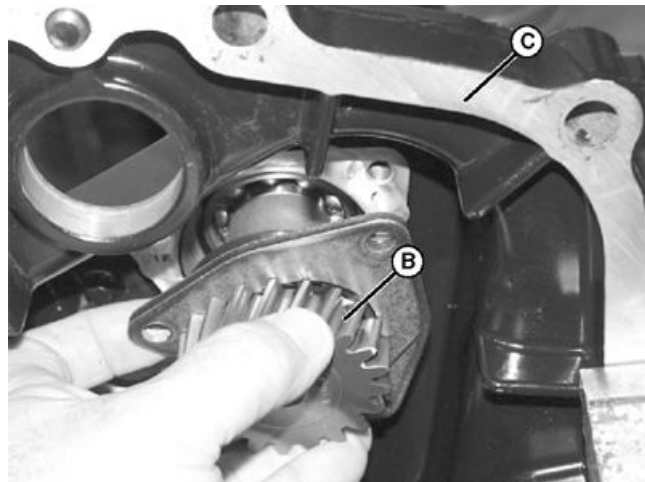
LVAL12352 —UN—29OCT10

SW03989,0000C7C -19-05NOV10-1/7

2. Remove main shaft assembly (B) from center plate (C).

B—Main Shaft Assembly

C—Center Plate



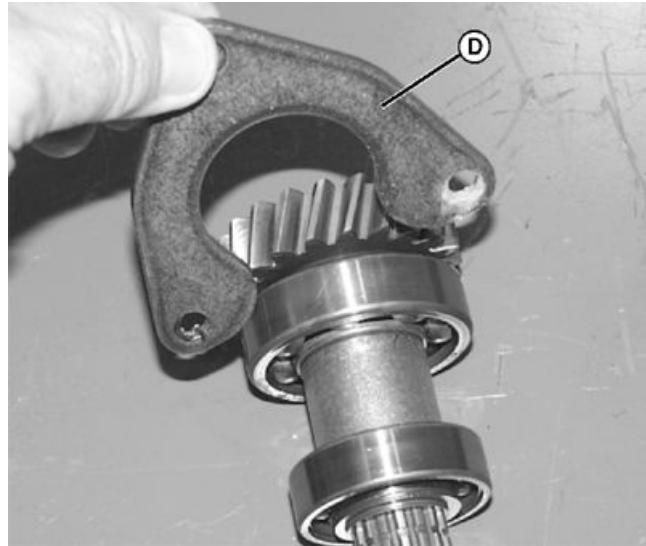
LVAL12353 —UN—29OCT10

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SW03989,0000C7C -19-05NOV10-2/7

3. Remove keeper plate (D).

D—Keeper Plate

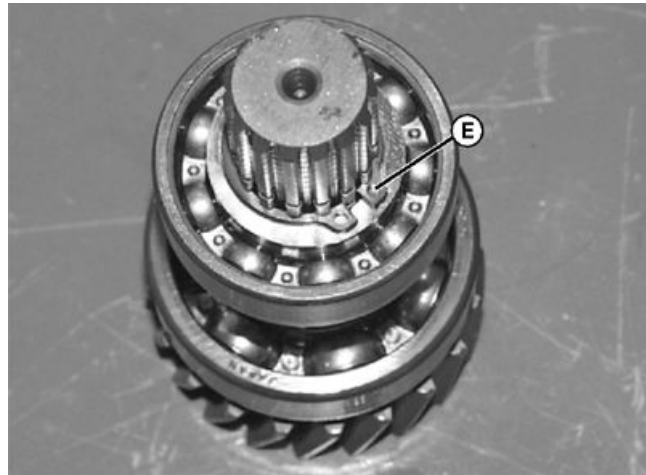


LVAL 12354 —UN—29OCT10

SW03989,0000C7C -19-05NOV10-3/7

4. Remove snap ring (E).

E—Snap Ring

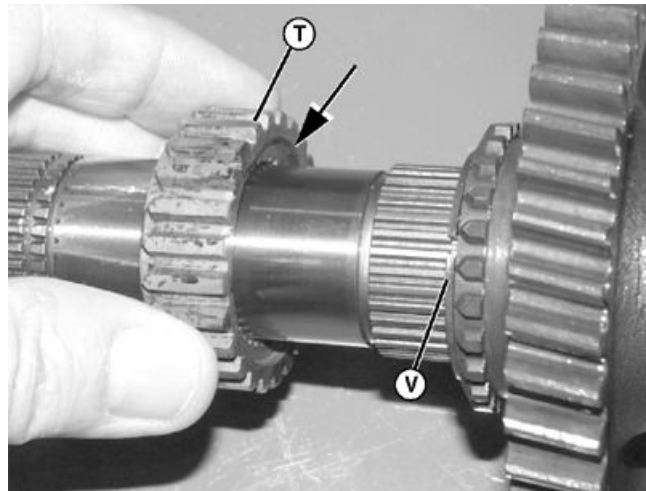


LVAL 12355 —UN—29OCT10

SW03989,0000C7C -19-05NOV10-4/7

5. Remove washer (F).

F—Washer



LVAL 12356 —UN—29OCT10

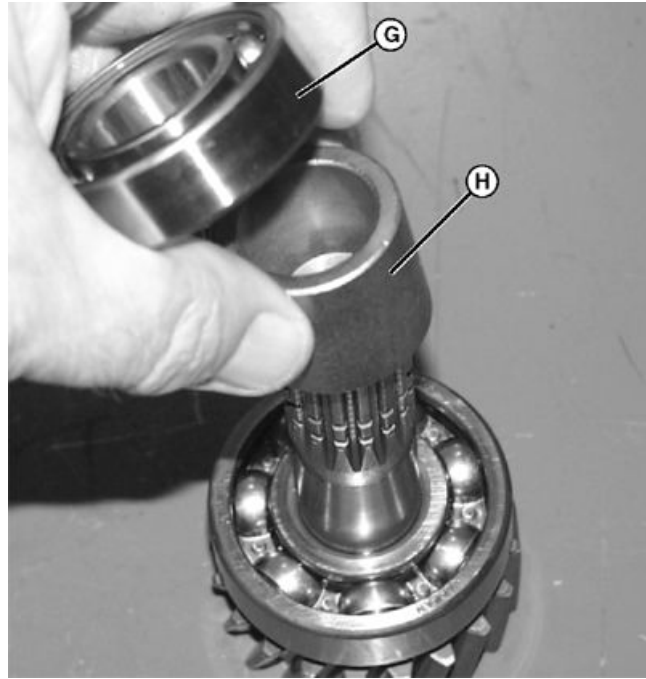
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SW03989,0000C7C -19-05NOV10-5/7

6. Remove bearing (G) using a bearing puller or a press. Remove spacer (H).

G—Bearing

H—Spacer



LVAL12357—UN—29OCT10

SW03989,0000C7C -19-05NOV10-6/7

7. Remove bearing (I) using a knife edge puller and a press.

IMPORTANT: Avoid Damage! DO NOT spin bearing using compressed air. Damage to bearing balls, cage, and races could result.

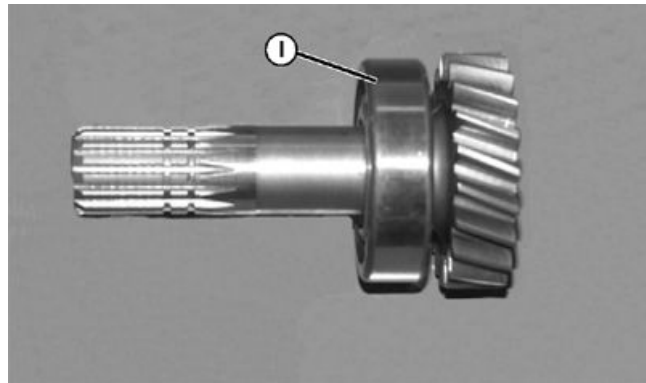
8. Clean all parts. Inspect bearings for discolored, burned balls and/or races. Check balls and races for spalling or cracking. Roll bearing by hand to check for rough turning or excessive looseness or play between balls and races. Replace bearings as required.
9. Inspect spines and gear teeth on shaft assembly for wear or damage. Replace shaft as required.

Assembly:

- Assemble main shaft in the reverse order of disassembly.
- Apply Loctite to keeper plate bolts and tighten to specification.

Specification

Keeper Plate
Bolt—Torque..... 28 N·m (21 lb.-ft.)



I— Bearing

- Oil the bearings after installation.

LVAL12358—UN—29OCT10

SW03989,0000C7C -19-05NOV10-7/7

Assemble Range Transmission (eHydro™)

1. Install new O-ring on shift shaft. Install pinion shaft (A) and shift shaft (B) assembly into transaxle case. Do not seat against transaxle case at this time. Leave a 14 mm (0.5 in.) gap between gear bearing boss in case (C). Align shift arm with slot in shift fork (D).

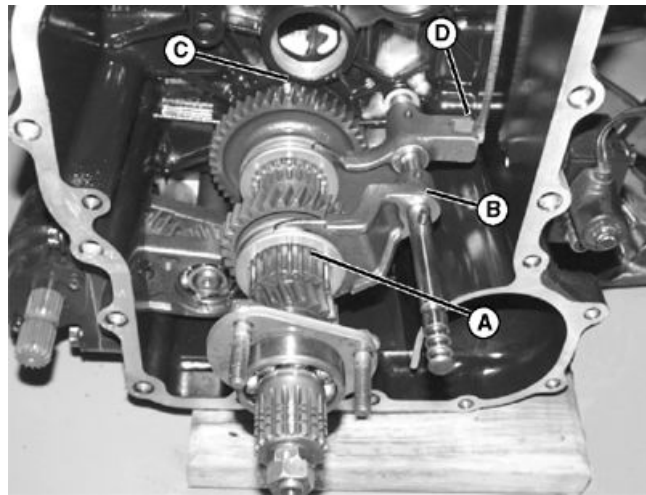
Specification

Gear Bearing

Boss—Gap..... 14 mm (0.5 in.)

A—Pinion Shaft
B—Shift Shaft

C—14 mm (0.5 in.) Gap
D—Shift Fork

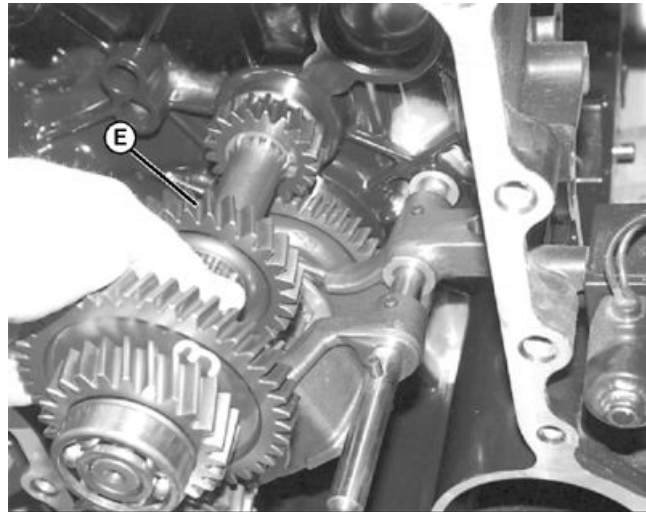


LVAL12359 —UN—29OCT10

SW03989,0000C7D -19-12NOV10-1/9

2. Install driven shaft (E). Seat all shafts against transaxle case. Check that shift arm is engaged in shift fork.

E—Driven Shaft

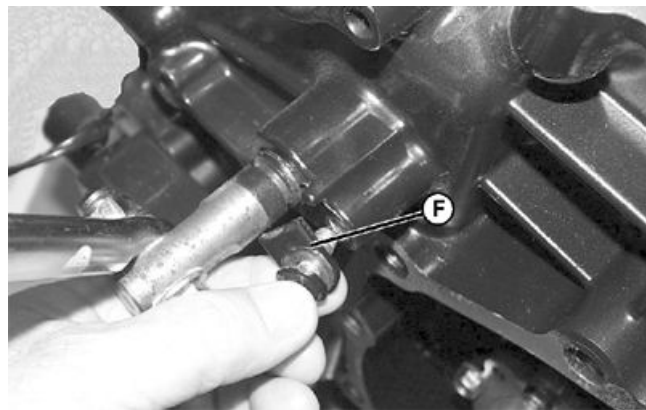


LVAL12360 —UN—29OCT10

SW03989,0000C7D -19-12NOV10-2/9

3. Install keeper plate (F) in shift shaft.
4. If not already done, clean all old gasket material from mating surfaces.

F—Keeper Plate



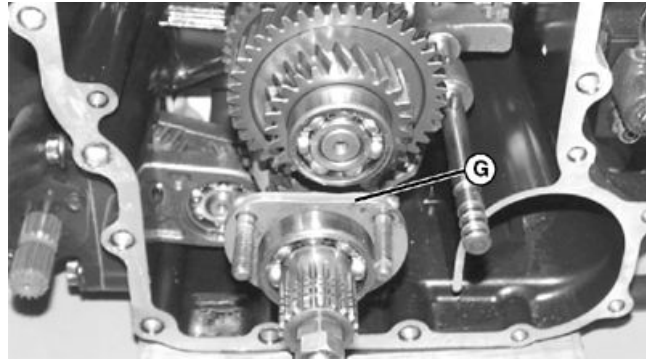
LVAL12361 —UN—29OCT10

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SW03989,0000C7D -19-12NOV10-3/9

5. Position flat side of bearing plate (G) as shown.

G—Bearing Plate



LVAL12362—UN—29OCT10

SW03989,0000C7D -19-12NOV10-4/9

NOTE: All fasteners in the transaxle except the two eccentric locking nuts on the end of the pinion shaft are to have thread locking compound applied during assembly. The bearing plate fasteners may have to be removed again for pinion depth adjustment, so you may want to wait until pinion shimming is correct before applying thread locker fasteners.

6. Install PTO shaft front bearing (H) through center plate. Install new gasket and begin installing center plate on alignment dowels.
7. Align driven shaft (I), shift shaft (J), the rear bearing plate studs (K), and the pinion shaft (L) with their respective holes in the center plate. Tap center plate into position with a soft hammer.
8. Install front bearing plate (N) and bolts (M). Tighten bolts to specification.

Specification

Front Bearing Plate

Bolt—Torque..... 56 N·m (41 lb.-ft.)

H—PTO Shaft Front Bearing	L—Pinion Shaft
I—Driven Shaft	M—Bolt (3 used)
J—Shift Shaft	N—Front Bearing Plate
K—Studs	



LVAL12363—UN—29OCT10

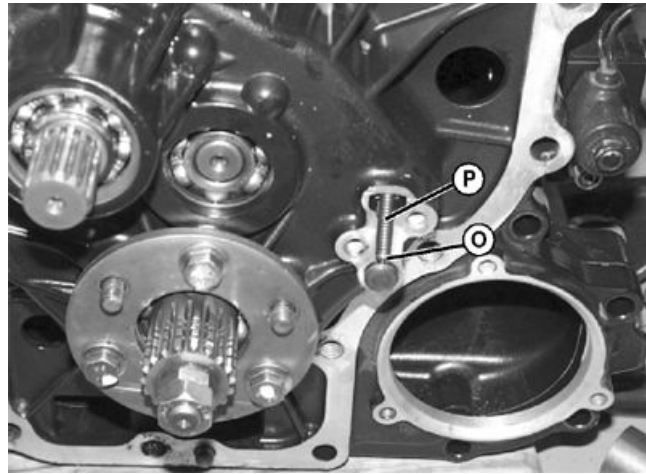
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SW03989,0000C7D -19-12NOV10-5/9

9. Install detent ball (O) and spring (P).

O—Detent Ball

P—Spring



LVAL12364—UN—29OCT10

SW03989,0000C7D -19-12NOV10-6/9

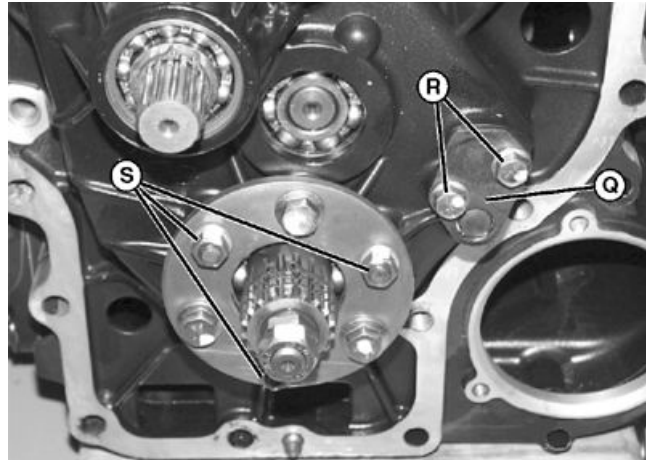
10. Install detent cover (Q) with bolts (R). Install lock washers and nuts (S) on bearing plate studs. Tighten bearing plate bolts and nuts to specification.

Specification

Bearing Plate Bolt And
Nut—Torque..... 56 N·m (41 lb.-ft.)

Q—Detent Cover
R—Bolt (2 used)

S—Lock Washers and Nut (3
used)



LVAL12365—UN—29OCT10

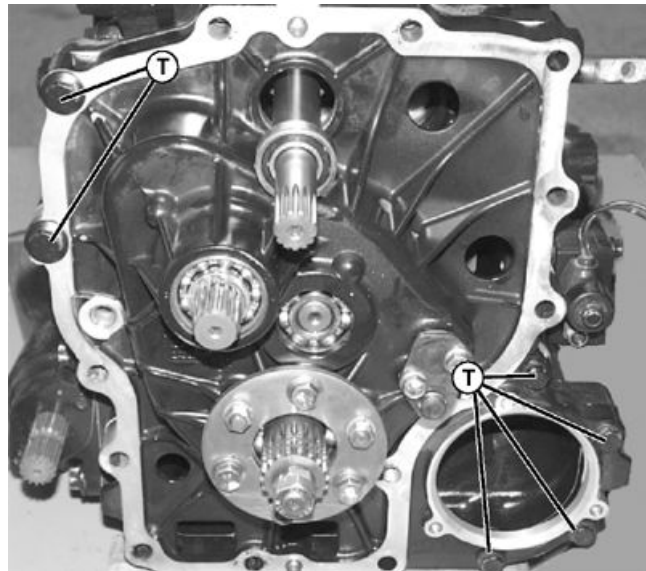
SW03989,0000C7D -19-12NOV10-7/9

11. Install bolts (T) in center plate and tighten to specification.

Specification

Range Transmission
Cover Bolt—Torque..... 56 N·m (41 lb.-ft.)

T—Bolt (6 used)



LVAL12366—UN—29OCT10

Continued on next page

SW03989,0000C7D -19-12NOV10-8/9

12. Check pinion shaft depth with 15.5 mm tool (A). Make sure tool is against ring gear. If tool is tight or “no go” side of tool fits between differential housing and pinion shaft, adjust pinion shaft depth. (See Differential Pinion Shaft Adjustment in Section 80, Group 35.)

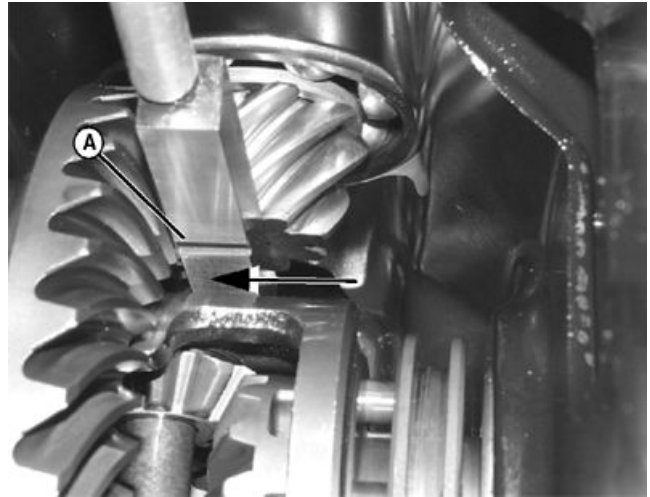
13. When pinion shaft depth is correct, apply Loctite to bearing plate bolts and nuts. Tighten bolts first, and then nuts, to specification.

Specification

Bearing Plate Bolt and

Nut—Torque..... 56 N·m (41 lb.-ft.)

A—15.5 mm Tool



LVAL12367 —UN—29OCT10

SW03989,0000C7D -19-12NOV10-9/9

Final Drive Removal

Left-Hand Final Drive Removal:

NOTE: Be sure to adequately support final drives before removing cap screws securing final drive to transmission housing.

Make sure opposite final drive is adequately supported, if applicable, before removing a final drive.

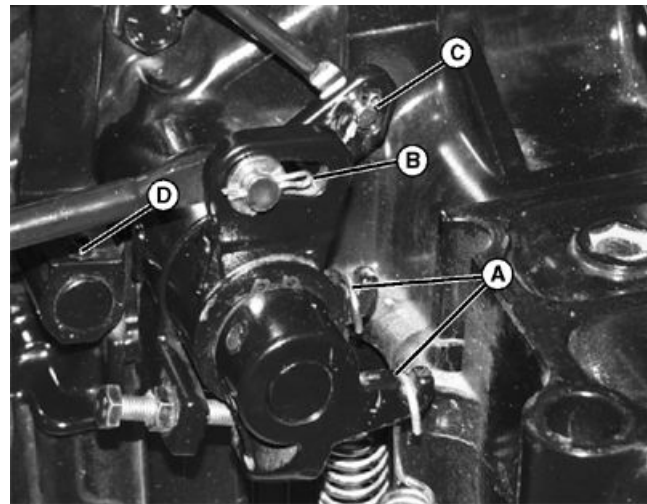
1. Remove rear wheels. (See Rear Wheel Removal and Installation in Section 120, Group 10.)
2. Remove rear fenders. (See Rear Fenders Removal and Installation in Section 120, Group 10.)
3. Remove ROPS. (See Roll Over Protection System (ROPS) in Section 120, Group 10.)
4. Drain oil from transaxle.
5. Disconnect lower three point lift link.
6. Disconnect differential lock pedal linkage.
7. Disconnect park brake springs (A).
8. Remove cotter pin and washer (B) and disconnect left brake rod.
9. Remove cotter pin (C) and disconnect park brake linkage.
10. Remove roll pin (D) and differential lock lever.
11. Remove brake shaft. (See Brake Shaft Removal and Installation in Section 110, Group 30.)

NOTE: Mark the cap screws for reinstallation locations.

12. Remove cap screws securing final drive to transmission housing. Mark cap screws for reinstallation locations. Separate final drive from transmission housing.

Right-Hand Final Drive Removal:

NOTE: Be sure to adequately support final drives before removing cap screws securing final drive to transmission housing.



A—Park Brake Spring (2 Used) C—Cotter Pin
B—Cotter Pin And Washer D—Roll Pin

Make sure opposite final drive is adequately supported, if applicable, before removing a final drive.

NOTE: Right-hand final drive is removed the same as the left-hand final drive.

1. Remove rear wheels. (See Rear Wheel Removal and Installation in Section 120, Group 10.)
2. Remove rear fenders. (See Rear Fenders Removal and Installation in Section 120, Group 10.)
3. Remove ROPS. (See Roll Over Protection System (ROPS) in Section 120, Group 10.)
4. Drain oil from transaxle.
5. Disconnect lower three point lift link.

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SW03989,0000C7E -19-11NOV10-1/2

LVAL12368 —UN—29OCT10

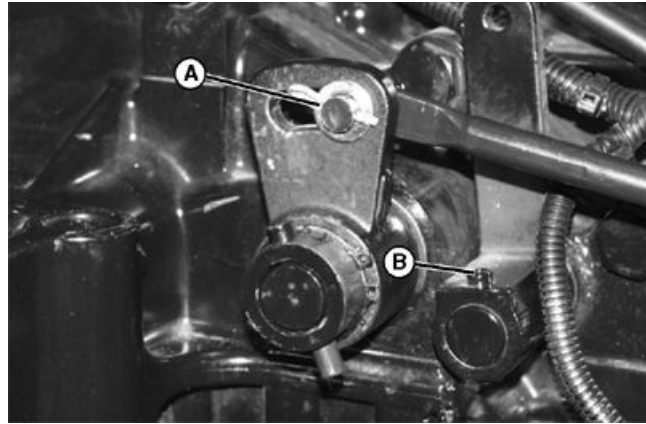
6. Remove cotter pin and washer from brake link rod (A). Disconnect brake link rod from brake arm.
7. Remove roll pin (B) and differential lock lever.
8. Remove brake shaft. (See [Brake Shaft Removal and Installation](#) in Section 110, Group 30.)

NOTE: Mark cap screws for reinstallation locations.

9. Remove cap screws securing final drive to transmission housing. Mark cap screws for reinstallation locations. Separate final drive from transmission housing.

A—Brake Link Rod

B—Roll Pin



LVAL12369—UN—29OCT10

SW03989,0000C7E -19-11NOV10-2/2

Final Drive Installation

Left-Hand Final Drive Installation:

NOTE: Be sure to adequately support final drive while installing.

Installation is reverse of removal.

Tighten final drive cap screws to specification.

Specification

Final Drive Cap
Screw—Torque..... 145 N·m (106 lb-ft)

Right-Hand Final Drive Installation:

NOTE: Be sure to adequately support final drive while installing.

Installation is reverse of removal.

Tighten final drive cap screws to specification.

Specification

Final Drive Cap
Screw—Torque..... 145 N·m (106 lb-ft.)

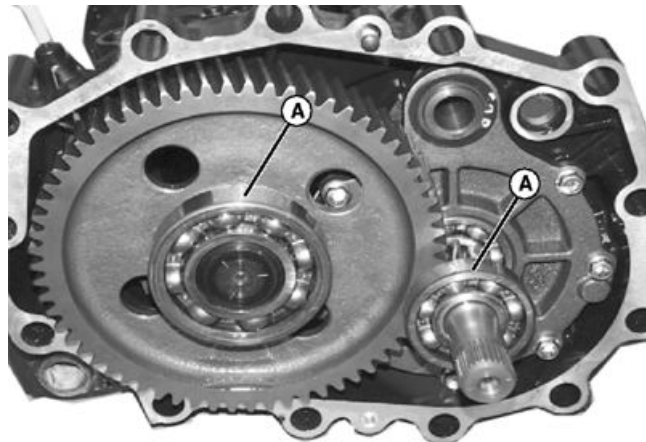
SW03989,0000C7F -19-05NOV10-1/1

Final Drive Disassemble, Inspect, and Assemble

NOTE: Left-hand final drive is shown in the following story. Right-hand drive disassembly, inspection, and assembly is basically the same.

Disassemble:

1. Remove final drive from the machine. (See [Final Drive Removal](#) in Section 80, Group 40.)
2. Remove bearings (A).
3. Remove final drive gear and spacer.
4. Remove four cap screws from oil seal housing at the end of the final drive.
5. Drive axle shaft out from final drive housing.



A—Bearings

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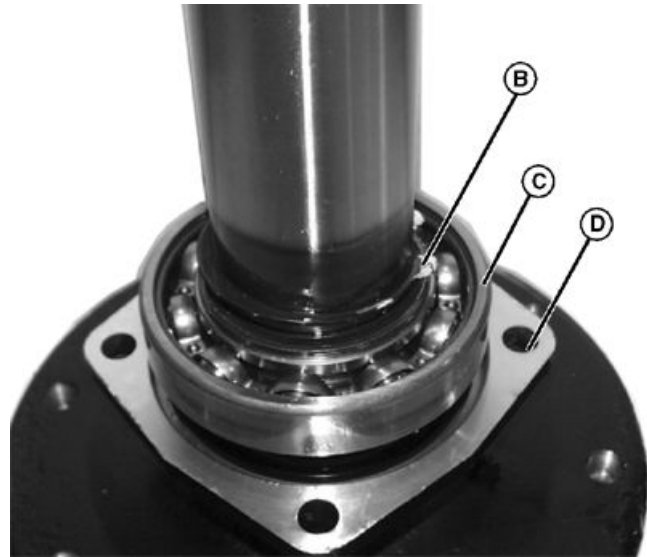
SW03989,0000C80 -19-11FEB11-1/5

LVAL12370—UN—29OCT10

6. Remove snap ring (B) and washer.
7. Remove bearing (C) and oil seal housing (D).
8. Replace oil seal in oil seal housing.

B—Snap Ring
C—Bearing

D—Oil Seal Housing



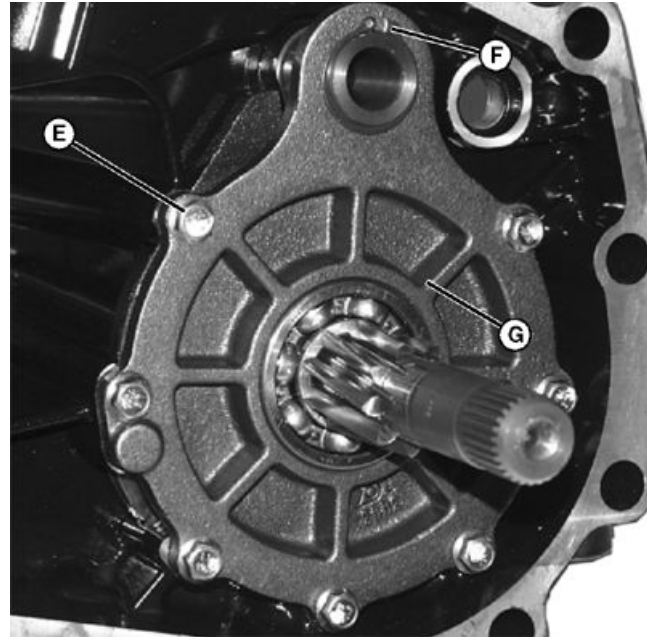
LVAL12371 —UN—29OCT10

SW03989,0000C80 -19-11FEB11-2/5

9. Remove seven cap screws (E).
10. Remove snap ring (F). Remove brake assembly (G).

E—Cap Screw (7 used)
F—Snap Ring

G—Brake Assembly



LVAL12372 —UN—29OCT10

Continued on next page

SW03989,0000C80 -19-11FEB11-3/5

11. Remove snap ring (H), friction disks and plates.
12. Drive out pinion shaft (I) from brake assembly cover.

H—Snap Ring

I— Pinion Shaft



LVAL12373—UN—29OCT10

SW03989,0000C80 -19-11FEB11-4/5

13. Remove bearing (J) from pinion shaft.

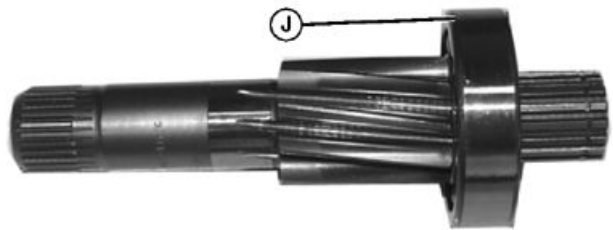
IMPORTANT: Avoid Damage! DO NOT spin bearing using compressed air. Damage to bearing balls, cage, and races could result.

14. Clean all bearings in a suitable solvent. Dry with compressed air.
15. Inspect all bearings for discolored, burned, balls and/or races. Check balls and races for spalling or cracking. Roll bearing by hand to check for rough turning or excessive looseness or play between balls and races. Replace bearings as required.
16. Inspect rear axle splines for damage. Inspect bearing areas of axle. If worn or damaged, replace axle.
17. Inspect bearing areas in rear axle housing. Bearings should be a snug fit. If bearings are loose in housing, replace rear axle housing.
18. Inspect pinion shaft splines for damage. Inspect bearing areas of pinion shaft. If worn or damaged, replace pinion shaft.

Assembly:

Assembly of the final drive is the reverse of disassembly.

- Install a new axle oil seal in oil seal housing whenever the axle has been removed.
- Place oil seal housing on axle and press outboard bearing on axle. Install axle in final drive housing.
- Tighten oil seal housing to final drive housing to specification.



J— Bearing

LVAL12374—UN—29OCT10

Specification

Oil Seal Housing to
Final Drive Housing Cap
Screw—Torque..... 28 N·m (21 lb.-ft.)

- Assemble brake. See Brake Assembly in Section 110, Group 10.
Install brake assembly. (See Brake Assemble in Section 110, Group 30.)
Tighten cap screws to specification.

Specification

Brake Assembly-to-Final
Drive Housing Cap
Screw—Torque..... 28 N·m (21 lb.-ft.)

- Assemble final drive housing to transmission housing and tighten cap screws to specification.

Specification

Final Drive Housing-to-
Transmission Housing
Cap Screw—Torque..... 145 N·m (107 lb.-ft.)

SW03989,0000C80 -19-11FEB11-5/5

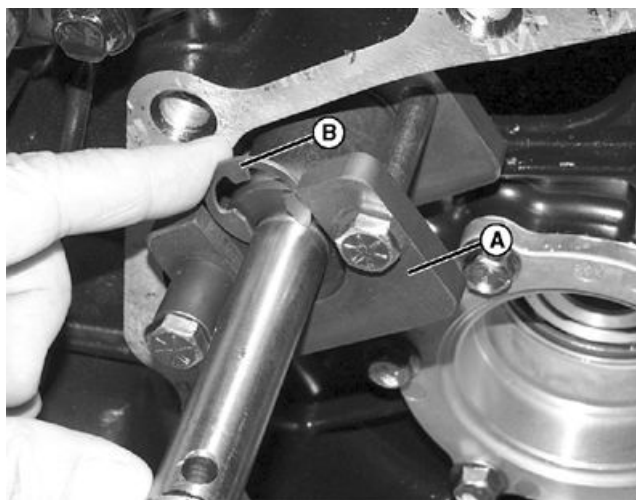
Differential Lock Fork

Removal:

1. Remove rockshaft assembly. (See [Rockshaft Removal and Installation](#) in Section 90, Group 35.)
2. Remove left final drive. (See [Final Drive Removal](#) in Section 80, Group 40.)
3. Remove right side differential lock lever or spacer from differential lock shaft.
4. Install tool (A). Compress spring tension and remove E-ring (B).
5. Remove tool.

A—Tool

B—E-Ring



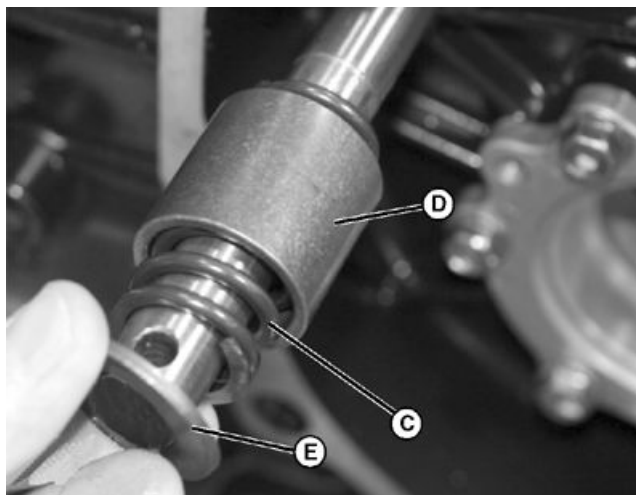
LVAL12375—UN—29OCT10

SW03989,0000C81 -19-14FEB11-1/4

6. Remove large washer (E), spring (C), and spacer (D).

C—Spring
D—Spacer

E—Large Washer



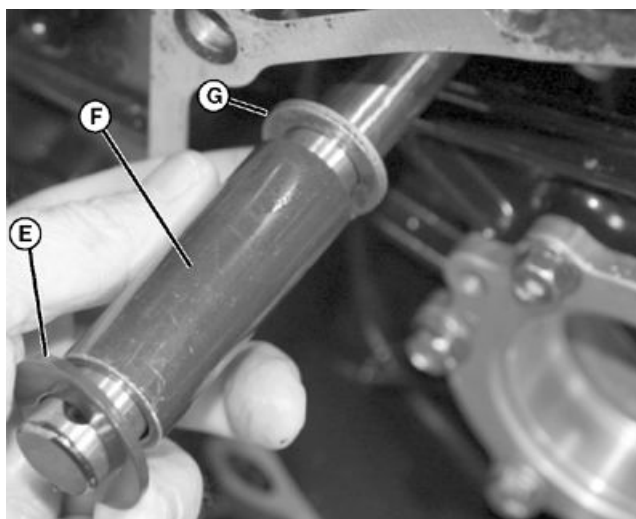
LVAL12376—UN—29OCT10

SW03989,0000C81 -19-14FEB11-2/4

7. Remove inside large washer (E), spacer (F), and small washer (G).

E—Large Washer
F—Spacer

G—Small Washer



LVAL12377—UN—29OCT10

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SW03989,0000C81 -19-14FEB11-3/4

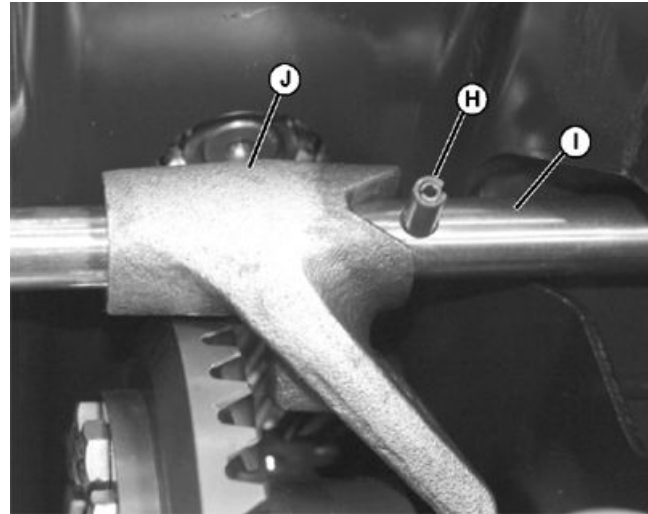
8. Drive inner and outer roll pins (H) out of differential lock shaft (I).
9. Remove differential lock fork (J) from differential lock shaft.

Installation:

Installation of differential lock fork is the reverse of removal.

H—Roll Pin (2 used)
I— Differential Lock Shaft

J— Differential Lock Fork



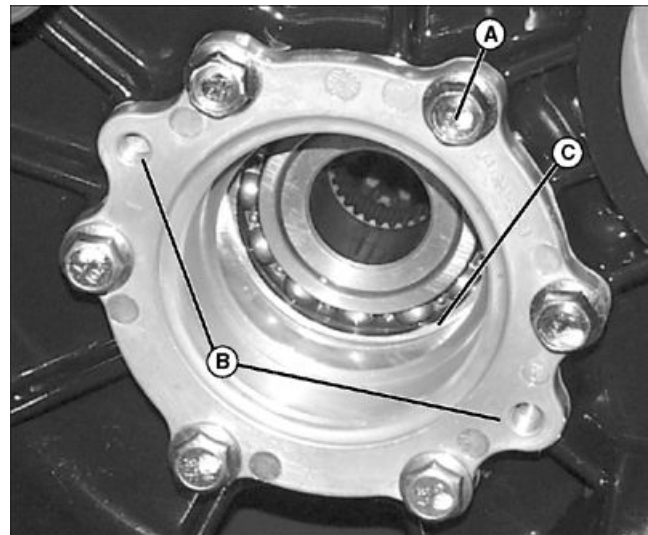
LVAL12378 —UN—29OCT10

SW03989,0000C81 -19-14FEB11-4/4

Differential Removal and Installation

Removal:

1. Remove PTO shaft, and clutch and brake assembly. (See PTO Clutch and Brake in Section 80, Group 50.)
2. Remove differential lock fork. (See Differential Lock Fork in Section 80, Group 40.)
3. If not already off, remove right final drive assembly.
4. Remove six bolts (A) securing differential bearing carrier to transmission housing.
5. Place two of the bolts in threaded holes (B) and alternately turn one half turn at a time to pull bearing carrier out of transmission housing.
6. Note location of shim (C) located between differential carrier and differential bearing.
7. Remove differential through top of transaxle case.



A—Bolt (6 used)
B—Threaded Hole (2 used)

C—Shim(s)

LVAL12379 —UN—12NOV10

Continued on next page

SW03989,0000C82 -19-11NOV10-1/7

Disassembly:

1. Remove bearings from differential.
2. Remove differential lock collar (D).

D—Differential Lock Collar



LVAL12380—UN—29OCT10

SW03989,0000C82 -19-11NOV10-2/7

3. Remove fourteen bolts (E) securing ring gear to differential. Remove ring gear.

E—Bolt (14 used)

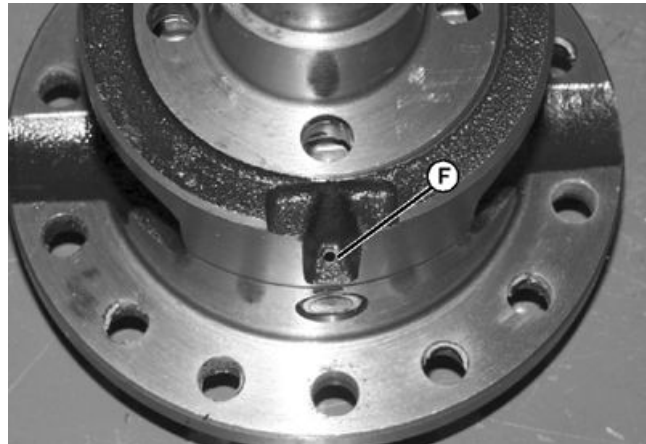


LVAL12381—UN—29OCT10

SW03989,0000C82 -19-11NOV10-3/7

4. Drive retaining spring pin (F) into differential housing until it clears pinion shaft.

F—Retaining Spring Pin



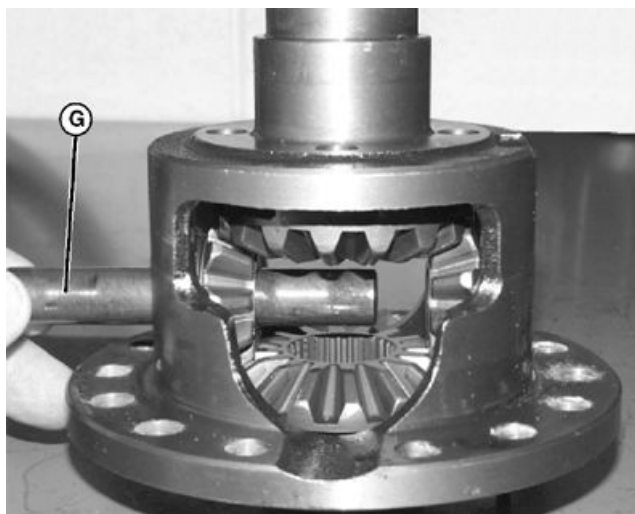
LVAL12382—UN—29OCT10

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SW03989,0000C82 -19-11NOV10-4/7

5. Remove pinion shaft (G).

G—Pinion Shaft

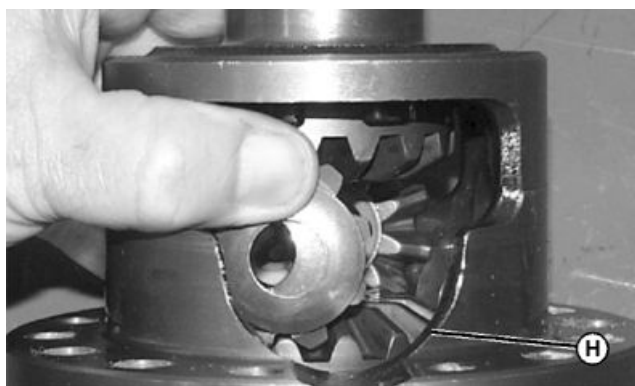


LVAL12383—UN—29OCT10

SW03989,0000C82 -19-11NOV10-5/7

6. Rotate gears to open spot in differential case (H), remove gears and thrust washers.

H—Differential Case



LVAL12384—UN—29OCT10

Continued on next page

SW03989,0000C82 -19-11NOV10-6/7

7. Inspect all gear teeth for wear and damage. Check back side of gears at thrust washer contact area for wear or damage. Check differential lock notches (I) for wear, damage, or rounded off corners. Check thrust washers for wear or damage. Replace any worn or damaged parts.

IMPORTANT: Avoid Damage! DO NOT spin bearing using compressed air. Damage to bearing balls, cage, and races could result.

8. Clean bearings in a suitable solvent. Dry with compressed air.
9. Inspect bearings for discolored, burned, balls and/or races. Check balls and races for spalling or cracking. Roll bearing by hand to check for rough turning or excessive looseness or play between balls and races. Replace bearings as required.

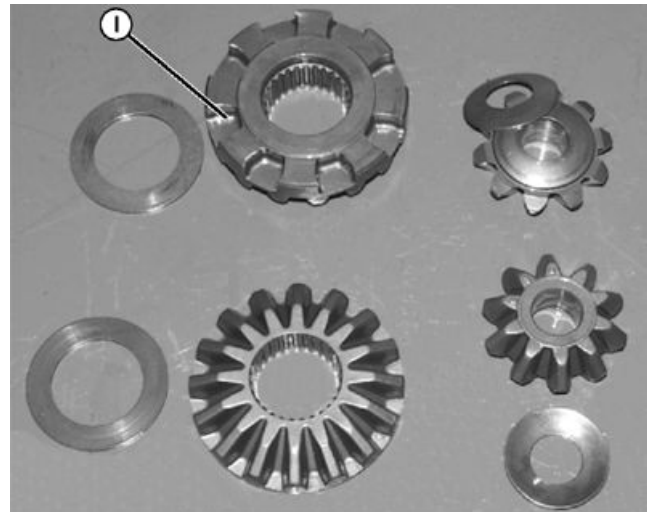
Assembly:

Assembly of the differential is the reverse of disassembly.

- Clean old Loctite from ring gear threads and differential housing holes.
- Apply grease to thrust washers to hold them in place while assembling.
- Install gears in differential housing. Make sure that differential lock gear is on correct side of housing.
- Apply Loctite to ring gear bolts when installing.
- Tighten in a cross pattern ring gear bolts to specification.

Specification

Ring Gear Bolt—Torque..... 78 N·m (58 lb.-ft.)



I— Differential Lock Notches

- Install differential into transaxle housing.
- Adjust backlash of differential. (See [Differential Backlash Adjustment](#) in Section 80, Group 35.)
- After obtaining correct backlash tighten differential carrier bolts to specification.

Specification

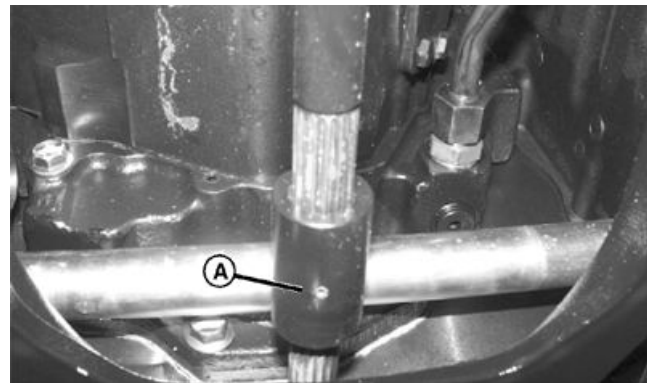
Differential Carrier
Bolt—Torque..... 28 N·m (21 lb.-ft.)

SW03989,0000C82 -19-11NOV10-7/7

MFWD Drive Shaft Removal and Installation

1. Remove spring pin (A) from drive shaft splined connector on each end of driveshaft.
2. Support drive shaft and slide splined connectors toward center of drive shaft, removing drive shaft from machine.
3. Installation is the reverse of removal.
4. Install new spring pins in connectors.

A—Spring Pin



SW03989,0000C83 -19-05NOV10-1/1

MFWD Removal and Installation

Removal:

1. Remove differential drive shaft.

NOTE: Steering cylinder fittings will squirt oil if the wheels are turned unless the hydraulic fittings are capped.

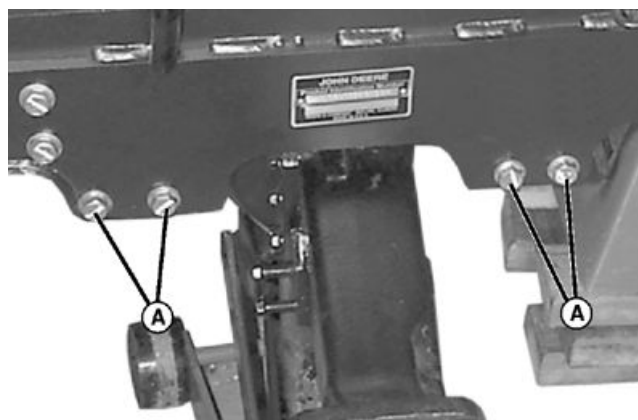
2. Label and remove power steering hoses from front axle steering cylinder. Cap steering cylinder hydraulic fittings.

NOTE: Machine splitting stands may be used for additional support.

3. Raise the front of the machine and remove front tires. Support frame to allow MFWD removal.

CAUTION: Avoid Injury! Properly support the MFWD axle assembly to prevent rotation on wheel bearings during removal.

4. Support the front axle with a floor jack.
5. Remove axle front trunnion mounting cap screws (A) on both sides of machine.

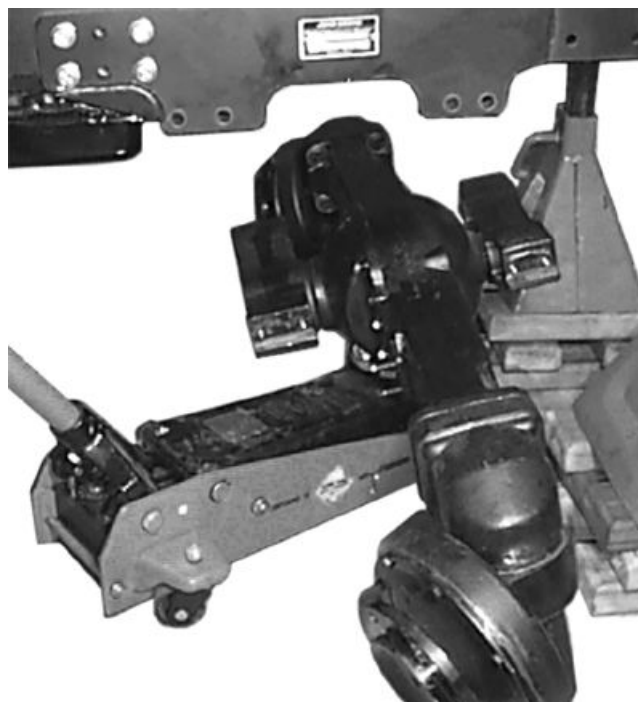


A—Cap Screw (8 used)

LVAL12387 —UN—29OCT10

SW03989,0000C84 -19-05NOV10-1/3

6. Lower floor jack and remove axle from machine.
7. Inspect axle pin bushings in trunnions and replace if necessary.



Front Trunnion Removal

LVAL12388 —UN—29OCT10

Continued on next page

SW03989,0000C84 -19-05NOV10-2/3

Installation:

1. Install new V-ring seals on axle pins.
2. Install trunnions on axle.
 - a. Place disk inside front trunnion. It may be necessary to stick disk in place with grease.
 - b. Loosen jam nut and bolt (A).
 - c. Raise axle with floor jack and align holes in trunnions with holes in frame (B).
 - d. Install and tighten eight trunnion mounting bolts.
 - e. Tighten bolt (A) till snug against axle pin. Back bolt out one quarter turn and tighten jam nut.
3. Connect steering cylinder hydraulic lines.
4. Install differential drive shaft.



A—Jam Nut and Bolt

B—Trunnion Mounting Holes in Frame (8 used)

LVAL12389—UN—29OCT10

SW03989,0000C84 -19-05NOV10-3/3

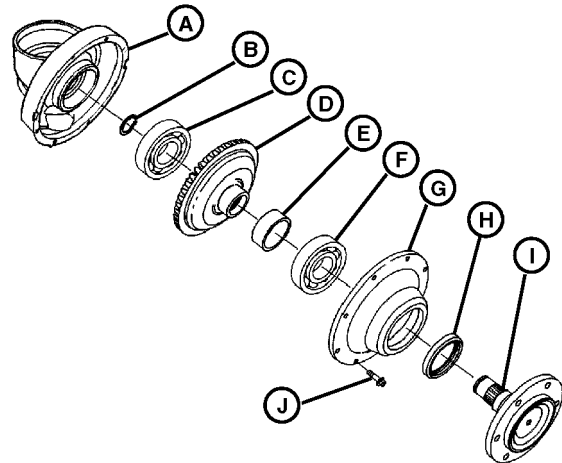
MFWD Final Drive Cover Removal and Inspection

Removal and Inspection:

1. Drain the differential and the final drive housing being serviced.
2. Raise and support the final drive being serviced.
3. Remove the wheel and tire from the final drive.
4. Remove eight cap screws. Separate the final drive cover and hub shaft assembly from the final drive housing.

NOTE: The final drive cover is sealed to the final drive housing. It may be necessary to pry the cover from the housing using the two reliefs on the sides of the cover.

5. Remove the snap ring (B).
6. Press the hub shaft (I) from the final drive cover, bearings, and bevel gear.
7. Disassemble the remaining components from the final drive cover assembly.
8. Clean and inspect all parts. Replace any unserviceable components.



A—Final Drive Housing
B—Snap Ring
C—Bearing
D—Bevel Gear 41T
E—Spacer

F—Bearing
G—Final Drive Cover
H—Seal
I—Hub Shaft
J—Cap Screw (8 Used)

LVAL12390—UN—29OCT10

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SW03989,0000C85 -19-12NOV10-1/2

Installation:

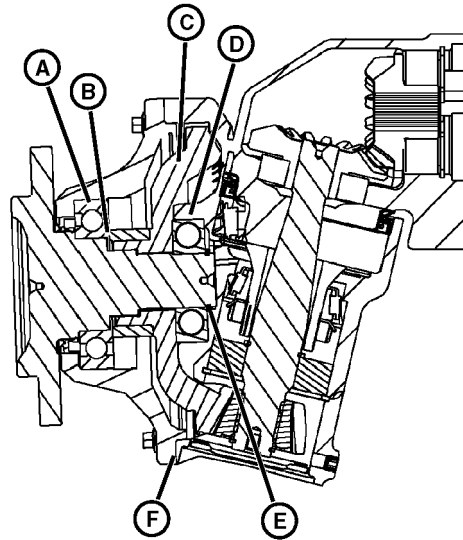
1. Coat the outer surface of a new hub seal with John Deere Sealant TY15130. Replace the hub seal.
2. Install the hub shaft through the seal and cover.
3. Place the bearing (A), spacer (B), bevel gear (C), and bearing (D) on the hub shaft. Secure with snap ring (E).
4. Apply John Deere Sealant TY6304 to the mating surface of the final drive cover (F). Install the final drive cover to the final drive housing. Tighten the cap screws to specification.

Specification

Cap Screw—Torque..... 30–38 N·m (22–28 lb.-ft.)

A—Bearing
B—Spacer
C—Bevel Gear

D—Bearing
E—Snap Ring
F—Mating Surface of the Final Drive Cover



LVAL12391 —UN—29OCT10

SW03989,0000C85 -19-12NOV10-2/2

MFWD Spindle Shaft**Removal and Disassembly:**

1. Carefully remove spindle cap (A) from housing.

A—Spindle Cap

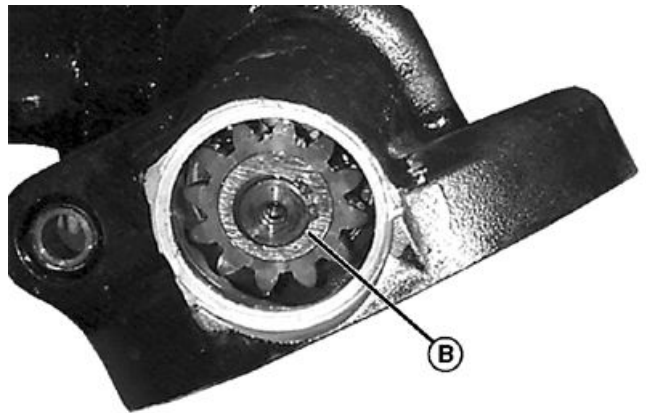


LVAL12392 —UN—29OCT10

SW03989,0000C86 -19-12NOV10-1/7

2. Remove snap ring (B) from spindle shaft.

B—Snap Ring



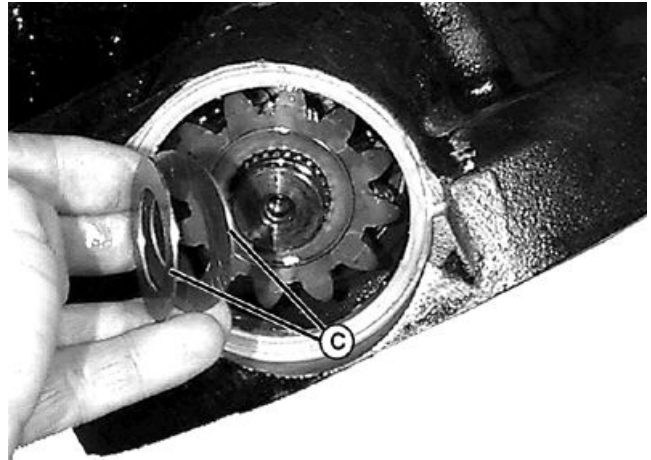
LVAL12393 —UN—29OCT10

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SW03989,0000C86 -19-12NOV10-2/7

3. Remove washer and shim(s) (C) from spindle shaft. Save any shim(s) from between washer and bevel gear.

C—Washer and Shim(s)

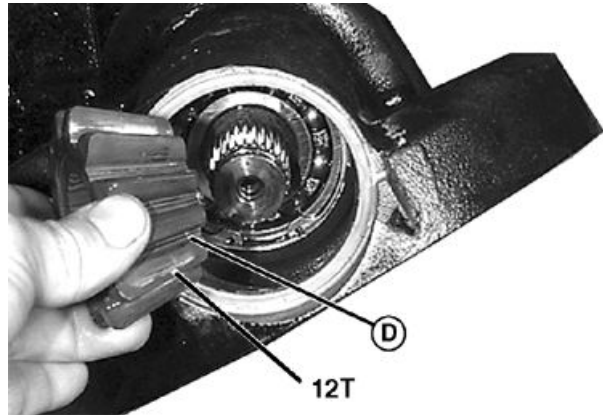


LVAL12394 —UN—29OCT10

SW03989,0000C86 -19-12NOV10-3/7

4. Remove bevel gear (D) from spindle shaft.

D—Bevel Gear

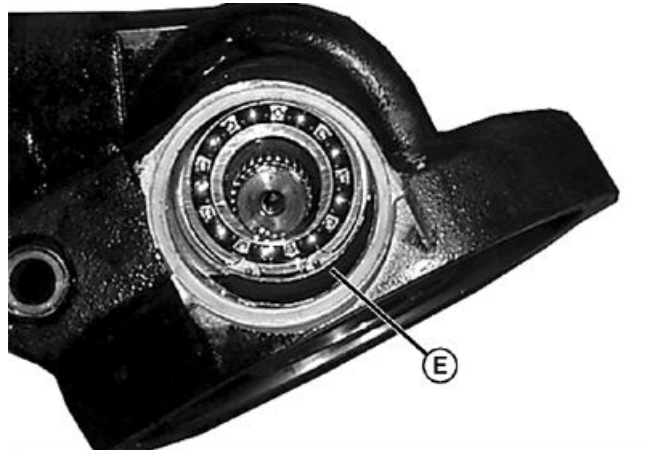


LVAL12395 —UN—29OCT10

SW03989,0000C86 -19-12NOV10-4/7

5. Remove snap ring (E) from spindle housing.

E—Snap Ring



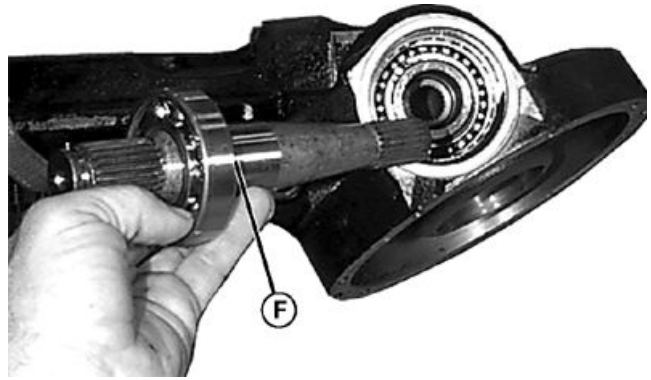
LVAL12396 —UN—29OCT10

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SW03989,0000C86 -19-12NOV10-5/7

6. Remove spindle shaft (F) and bearing from spindle housing.
7. Remove snap ring and bearing from spindle shaft. Inspect and replace worn or damaged parts. Replace unserviceable components.

F—Spindle Shaft



LVAL12397—UN—29OCT10

SW03989,0000C86 -19-12NOV10-6/7

Assembly and Installation:

1. Install bearing (A) and snap ring (B) on spindle shaft.
2. Install spindle shaft assembly in final drive housing.
3. Install internal snap ring (C) in final drive housing.
4. Install bevel gear 12T (D), any shim(s) (E), washer (F), and snap ring (G) on spindle shaft.
5. Install final drive cover to final drive housing, if removed.
6. To set the backlash of the lower final drive, shim the bevel gear to achieve end play within specification.

Specification

Lower Final
Drive—Backlash.....0.64—0.76 mm (0.025—0.030 in.)

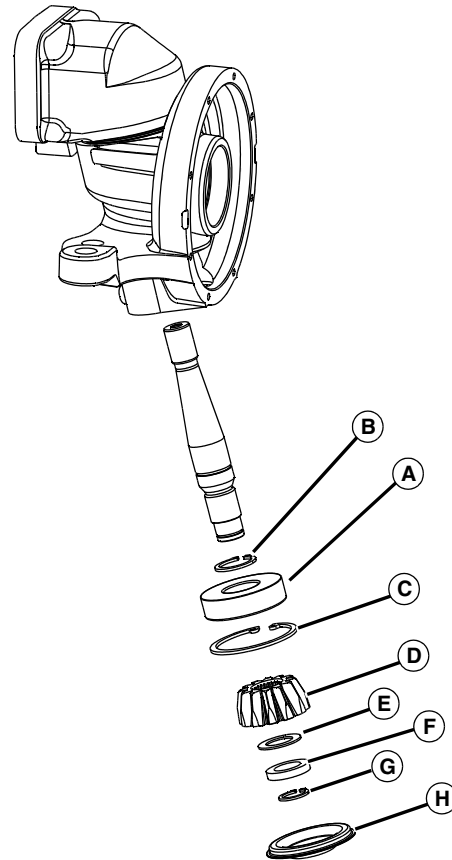
7. The backlash sets end play within specification.

Specification

Lower Final Drive End
Play—Backlash.....0.13—0.18 mm (0.005—0.007 in.)

8. Apply John Deere TY15941 retaining compound to final drive housing cap (H) and install.

A—Bearing	E—Shim(s)
B—Snap Ring	F—Washer
C—Internal Snap Ring	G—Snap Ring
D—Bevel Gear, 12T	H—Cap



LVAL12398—UN—29OCT10

SW03989,0000C86 -19-12NOV10-7/7

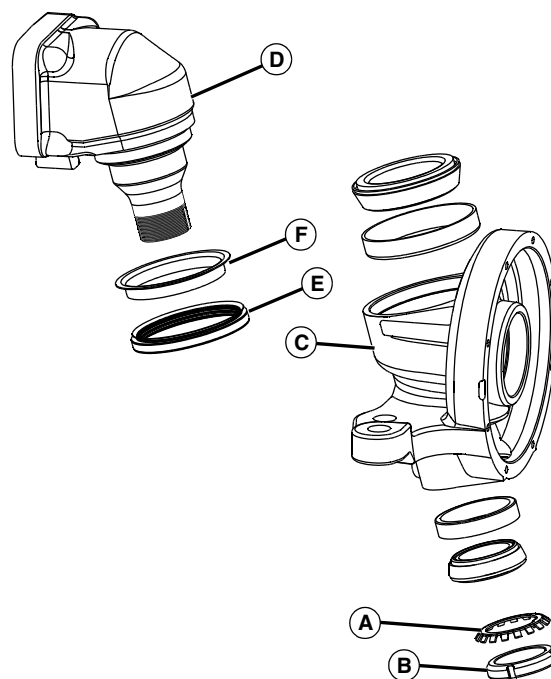
MFWD Final Drive Housing

Tools Required:

- KML 10008 Ring Nut Socket

Disassembly:

1. Remove final drive cover. (See MFWD Final Drive Cover Removal and Inspection in Section 80, Group 40.)
2. Remove final drive spindle shaft. (See MFWD Spindle Shaft in Section 80, Group 40.)
3. Straighten tabs on locking washer (A) that secure retaining spanner nut (B) in place. Remove retaining spanner nut from final drive housing.
4. Remove final drive housing (C) from spindle housing (D), and put final drive housing in a vise.
5. Remove bearing cups and bearing cones from final drive housing. Clean and inspect all components. Replace any unserviceable components.
6. Remove seal (E) and seal sleeve (F) from spindle housing.



A—Locking Washer
B—Spanner Nut
C—Final Drive Housing

D—Spindle Housing
E—Seal
F—Seal Sleeve

LVAL12399—UN—29OCT10

Continued on next page

SW03989,0000C87 -19-20APR12-1/2

Assembly:

1. Clean seal sleeve (F), replace if worn or scratched.
2. Replace final drive housing seal (E).
3. Install bearing cups and cones in final drive housing (C).
4. Install spindle housing to final drive housing.
5. Install locking washer (A) to spindle housing (D).
6. Install a new bearing retaining spanner nut (B) on final drive housing. To correctly install nut:
 - a. Tighten the spanner nut to specification. Oscillate the final drive housing on the spindle housing several times to seat the bearing.

Specification

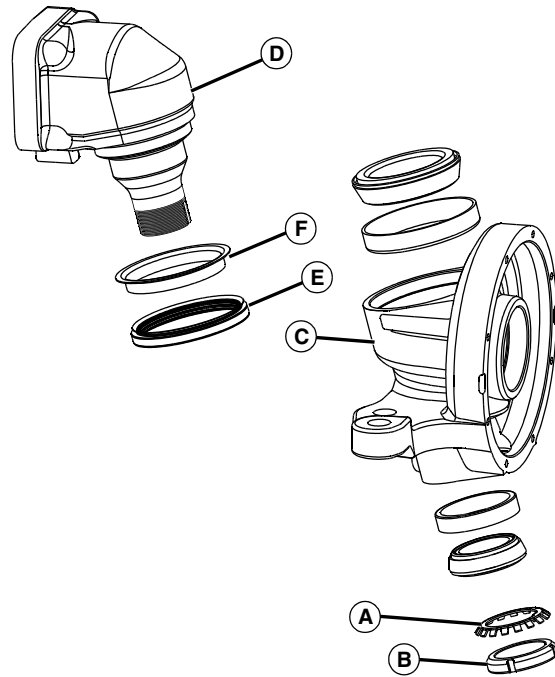
Spanner Nut—Torque..... $40.7 \pm 2.7 \text{ N}\cdot\text{m}$ ($30 \pm 2 \text{ lb}\cdot\text{ft.}$)

- b. Shock the wheel end by hitting end stops with a soft mallet.
- c. Retighten the spanner nut to specification.

Specification

Spanner Nut—Torque..... $40.7 \pm 2.7 \text{ N}\cdot\text{m}$ ($30 \pm 2 \text{ lb}\cdot\text{ft.}$)

- d. Bend a locking washer tab into slot in spanner nut.
7. Install spindle shaft. (See [MFWD Spindle Shaft](#) in Section 80, Group 40.)
8. Install final drive cover. (See [MFWD Final Drive Cover Removal and Inspection](#) in Section 80, Group 40.)



A—Locking Washer
B—Spanner Nut
C—Final Drive Housing

D—Spindle Housing
E—Seal
F—Seal Sleeve

LVAL12400 —UN—29OCT10

SW03989,0000C87 -19-20APR12-2/2

MFWD Spindle Housing

Removal and Disassembly:

1. Remove the final drive housing. (See MFWD Final Drive Cover Removal and Inspection in Section 80, Group 40.)
2. Remove four cap screws fastening the spindle housing to the MFWD housing.
3. Remove the internal snap ring from the spindle housing.
4. Remove the bearing and axle gear (12T) assembly from the spindle housing.
5. Remove the bearing and upper bevel gear (15T) assembly from the spindle housing.
6. If necessary press the bearings from the gears.

NOTE: The bearings are pressed onto the gears, and are slip fits into the housing.

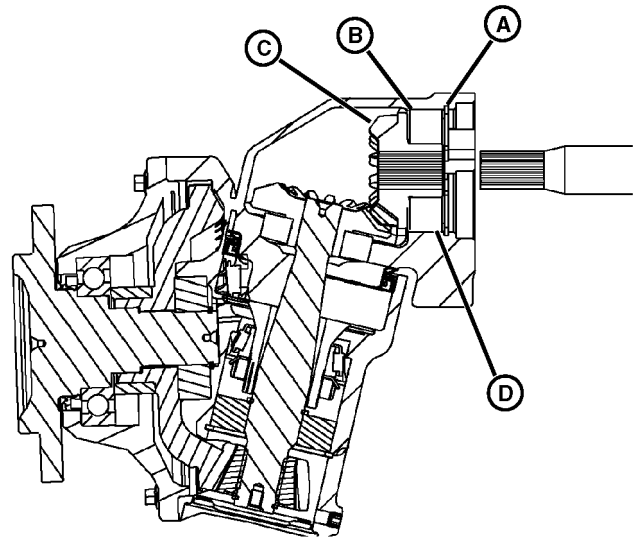
7. Clean and inspect all parts. Replace any unserviceable parts.

Assembly and Installation:

1. Install the bearing and upper bevel gear (15T) assembly to the spindle housing.
2. Install the bearing and axle gear (12T) assembly to the spindle housing.
3. Install the internal snap ring to the spindle housing.
4. Set the backlash of the axle gear:
 - a. Measure the distance between the bearing and the snap ring at several locations.
 - b. Shim the bearing and axle gear to end play specification, to achieve backlash to specification.

Specification

Bearing And Axle	
Gear—End Play.....	0.15–0.28 mm (0.006–0.011 in.)
Backlash.....	0.10–0.20 mm (0.004–0.008 in.)



A—Shim(s)
B—Bearing

C—Axle Gear, 12T
D—Snap Ring

5. Apply John Deere TY6304 sealant to the mating surfaces of the MFWD housing and the spindle housing.
6. Install the spindle housing to the MFWD housing:
 - a. Apply John Deere TY9371 to the threads, and install four cap screws fastening the spindle housing to the MFWD housing.
 - b. Tighten the cap screws to specification.

Specification

Cap Screw—Torque.....286–316 N·m (211–233 lb.-ft.)

7. Install the final drive housing.

LVAL12401—UN—29OCT10

SW03989,0000C88 -19-12NOV10-1/1

MFWD Differential

Removal and Disassembly:

1. Raise and support front of machine.
2. Drain oil from front axle housing and both final drives.
3. Disconnect tie rod and steering cylinder.
4. Remove four cap screws fastening each spindle housing to MFWD axle housing and remove spindles/final drives as an assembly.
5. Remove both axle shafts from MFWD housing.
6. Remove the roll pin from the rear MFWD drive shaft. (See [MFWD Drive Shaft Removal and Installation](#) in Section 80, Group 40.)
7. Remove cap screws fastening the differential carrier housing to the MFWD axle housing and remove carrier assembly.
8. Mark bearing caps and carrier housing to assure they are assembled in their original positions. Remove cap screws from the bearing caps.
9. Remove the differential case from the differential carrier housing.
10. Remove ring gear cap screws. Remove the ring gear from the differential case.

NOTE: The differential case and internal parts come as an assembly. If any damage is apparent, there is no need to disassemble the case, as the whole assembly must be replaced.

11. Clean and inspect all parts and check parts for wear. Replace any unserviceable parts.
12. Remove pinion nut. Do not discard nut at this time.
13. Remove differential pinion from differential carrier housing.

IMPORTANT: Avoid Damage! The pinion retaining nut is a special "torque prevailing" nut. ALWAYS replace this nut DO NOT reuse.

NEVER tighten a torque prevailing nut with an impact wrench.

ALWAYS use a torque wrench to correctly tighten torque prevailing nuts.

14. Disassemble pinion shaft assembly.

NOTE: The ring gear and pinion gear are serviced as an assembly. If either the ring gear or pinion has wear or damage both must be replaced.

15. Clean and inspect all parts and check parts for wear. Replace any unserviceable parts.

Assembly and Installation:

1. Assemble bearing cone (D) to pinion (E).
 - The inner shim(s) (B) are under bearing cup (C) and set pinion height. If the original pinion is being used, use the original shims, or install new shims the same thickness as original shims.
 - If ring and pinion are being replaced, notice the (+) or (-) number (P) on end of pinion gear. This indicates the best running position of each particular gearset in thousandths of an inch. If the number on the new set is not the same as the number on the one being replaced, adjust the height by adding or removing inner shim(s) (B) from original shim pack according to dimension etched in head of pinion.
 - Example: If the old pinion reads +2 and the new pinion is marked -1, add 0.003 in. shims to the original shim pack.

NOTE: Number (Q) on pinion and ring gear indicate matched set. Make sure numbers on ring and pinion gears match before assembling.

- Assemble the inner bearing cup (C) and any shims (B) in the differential carrier housing.
 - Place the pinion in the carrier housing, and install the spacer (G), outer shim (H), bearing cup (I), bearing cone (J), O-ring (K), spacer (L), seal (M), and the old nut (N).
2. Tighten the old pinion nut to specification and check the rotation of the pinion:

Specification

Old Pinion Nut—Torque..... 257—285 N·m (190—210 lb.-ft.)

- Require torque turn specification to rotate the pinion.

Specification

Rotate The
Pinion—Torque Turn..... 0.8—1.4 N·m (7—12 lb.-in.)

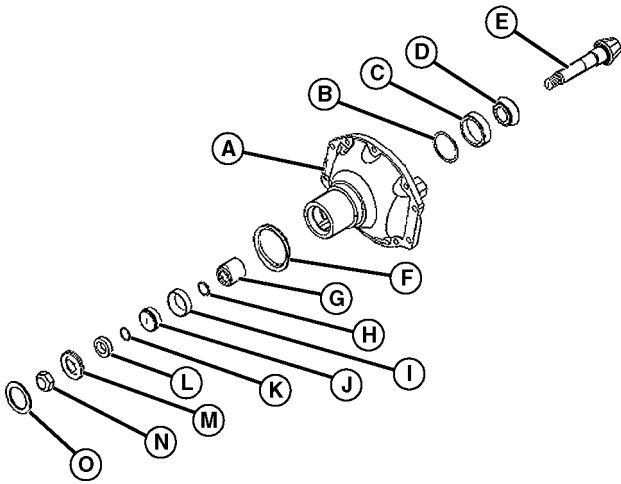
- If the pinion does not turn within specification, adjust the shim pack. Add shims if torque is too high, remove shims if torque is too low.
3. When the pinion is shimmed correctly replace the old pinion retaining nut with a new pinion retaining nut. Tighten the new nut to specification, and recheck the rotation of the pinion.

Specification

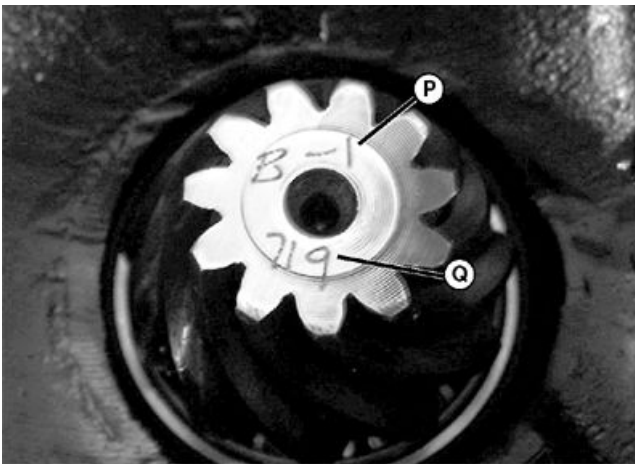
New Pinion Retaining
Nut—Torque..... 257—285 N·m (190—210 lb.-ft.)

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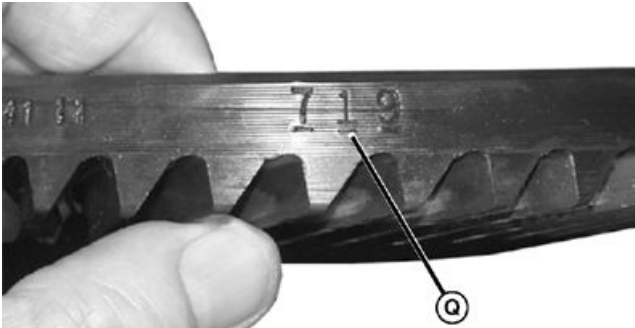
OUO1082,0005E8F -19-30NOV12-1/4



LVAL12402 —UN—29OCT10



LVAL12403 —UN—29OCT10



LVAL12404 —UN—29OCT10

- | | |
|-------------------------------|---|
| A—Carrier Housing | J—Bearing Cone |
| B—Inner Pinion Shim | K—O-ring |
| C—Bearing Cup | L—Spacer |
| D—Bearing Cone | M—Seal |
| E—Pinion | N—Nut |
| F—V-ring Seal | O—Thrust Washer |
| G—Inner Pinion Spacer | P—Best Running Position of Gear |
| H—Pinion Bearing Preload Shim | Q—Pinion And Ring Gear Matched Set Number |
| I—Bearing Cup | |

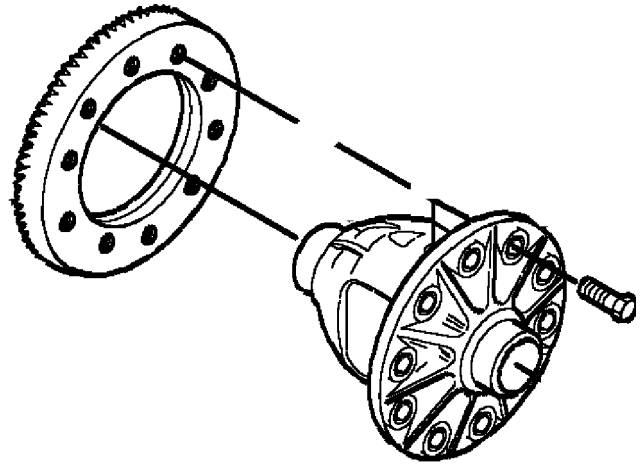
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OUC1082,0005E8F -19-30NOV12-2/4

4. Install the ring gear to the differential case. Tighten the ring gear bolts to specification.

Specification

Ring Gear Bolt—Torque..... 79—88 N·m (58—65 lb.-ft.)



LVAL12405—UN—29OCT10

Ring Gear to Differential Case Assembly

OUO1082,0005E8F -19-30NOV12-4/4

NOTE: There may be several shims on each side of differential case.

5. If bearings (R) were removed, place original shims (S) or new shims equaling the same thickness, on the same side of the differential assembly (T) they were removed from. Install new bearings on the differential assembly.
6. Using marks made during disassembly, install the bearing caps (U) in their original positions. Tighten the cap screws for the bearing caps to specification.

Specification

Bearing Cap—Cap
Screw—Torque..... 54—68 N·m (40—50 lb.-ft.)

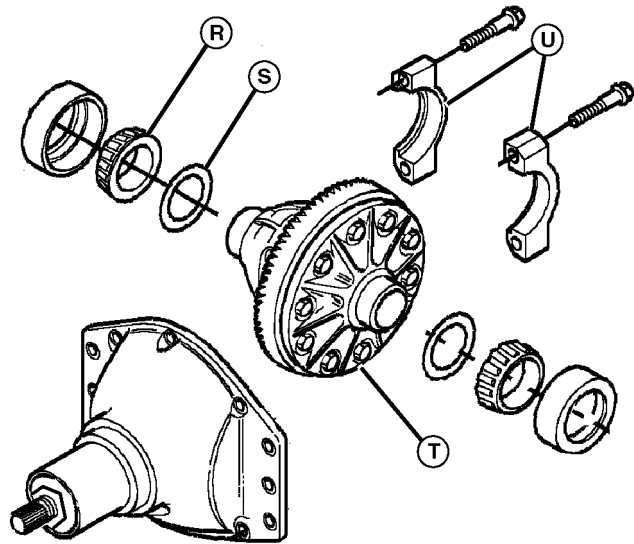
- The bearing shim(s) (S), control the ring and pinion backlash and the preload of the differential bearings. If the original differential case, bearings, and gearset are being used, install the original shims, or new shims totaling the original thickness.
- If the differential case bearings or gearset are being replaced, set the bearing preload and gear backlash by adding or removing shim(s) between the ring gear side bearing and differential case.
- Shim the bearings to preload specification.

Specification

Bearing—Preload..... 0.03—0.09 mm (0.001—0.004 in.)

7. Install the differential case assembly to the differential carrier housing. Check gear backlash with a dial indicator.
 - Gear backlash is adjusted by changing the shim pack thickness on the ring gear side bearing. Removing shims increases backlash, adding shims decreases backlash.

IMPORTANT: Avoid Damage! Whatever shim thickness is added to one side of the differential case must be removed from the other side. Or whatever shims are removed from one side must be added to the other to keep bearing preload from changing.



R—Bearing (2 used)
S—Shim(S)

T—Differential Assembly
U—Bearing Cap (2 used)

8. Adjust backlash to specification.
9. Apply John Deere Sealant TY6304 to the differential carrier housing.
10. Install the differential carrier housing to the MFWD housing.
11. Apply John Deere TY9370 thread lock and sealer to all cap screws securing the differential carrier housing. Tighten the cap screws to specification.

Specification

Differential
Assembly—Backlash..... 0.08—0.18 mm (0.003—0.007 in.)
Differential Carrier
Housing Cap
Screw—Torque..... 102—108 N·m (75—80 lb.-ft.)

LVAL12406—UN—29OCT10

OUO1082,0005E8F -19-30NOV12-5/4

Pinion Depth Setup and Adjustment

Required only if differential carrier housing is replaced using any gearset that was not installed with that carrier housing at the factory.

Tools Required:

- JDG 1395A Differential Setup Tool Kit

Procedure:

1. Remove inner pinion bearing cup (if installed) and retain any shims from behind cup for possible re-use. Install tool (A) into pinion bearing bore.
2. Install tool (B) across differential bearing saddles.
3. While holding the tool (B) down, measure the distance between the two tools with a feeler gauge. (This value will generally be between **0.64—0.86 mm (0.026—0.034 in.)**, But it is acceptable to have measurements between **0.45—0.96 mm (0.018—0.038 in.)**. Record the measurement.

Specification

Approximate—Distance.....0.64—0.86 mm (0.026—0.034 in.)

Specification

Acceptable—Distance.....0.45—0.96 mm (0.018—0.038 in.)



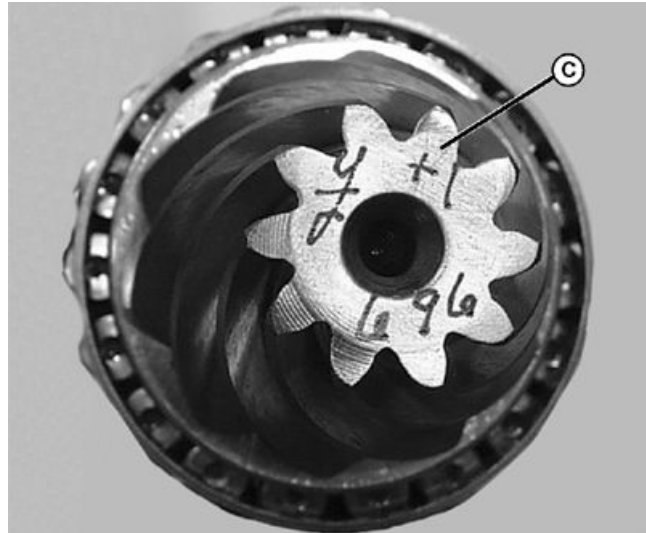
A—Tool—(Pinion Bearing Bore)

B—Tool—(Differential Bearing Saddles)

LVAL12407 —UN—29OCT10

SW03989,0000C8A -19-16NOV10-1/4

4. Locate the (+) or (-) number (C) on the end of the pinion gear. This number indicates the best running position of each particular gearset in thousandths of an inch.
5. The shim pack thickness to be used under the pinion bearing cup is calculated as follows:
 - Use the feeler gauge thickness dimension measured in step 3.
 - If the number on the pinion is a (+) number SUBTRACT that number in thousandths of an inch from the feeler gauge thickness dimension measured in step 3.
 - If the number on the pinion is a (-) number ADD that number in thousandths of an inch to the feeler gauge thickness dimension measured in step 3.
 - After calculating shim pack thickness, assemble a shim pack measuring the exact amount calculated above and place it under the pinion bearing cup.



C—Best Running Position of Gear

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SW03989,0000C8A -19-16NOV10-2/4

Determining Differential Bearing Preload:

1. Place the bearing substitute tool (D) on each side of the differential case.
2. Pry the differential back and forth with a small bar to seat the bearing tools against the outer edges of bearing bores.
3. Pry the differential all the way over against one of the bearing tools.
4. Using a feeler gauge, measure the gap between the differential carrier and the bearing tool (E). Record the measurement.
5. Add **0.03—0.09 mm (0.001—0.004 in.)** to the measurement for bearing preload.

Specification

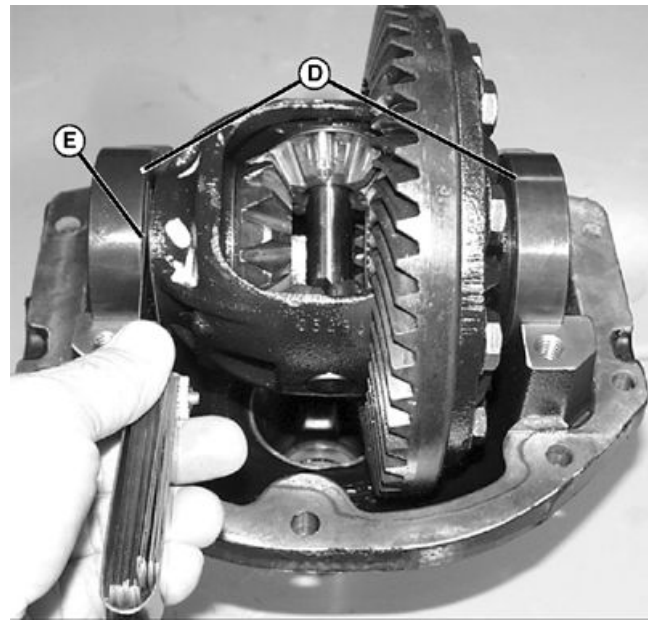
Additional Bearing

Preload Gap—Gap.....0.03—0.09 mm (0.001—0.004 in.)

6. Assemble a shim pack measuring the exact amount of the calculation above.

Differential Backlash Adjustment:*NOTE: Pinion shaft assembly must be installed.*

1. Install pinion shaft, per assembly/installation. (See Machine Splitting (Rear) in Section 70, Group 40.)
2. Divide the shim pack assembled in the previous step into two stacks with the thickness of the two stacks being as equal as possible.

**D—Bearing Substitute Tool****E—Differential Carrier And The Bearing Tool**

3. Install one shim pack and a bearing substitute tool on each side of the differential case.

Continued on next page

SW03989.0000C8A -19-16NOV10-3/4

LVAL12409—UN—29OCT10

4. Install dial indicator to measure ring gear movement.
5. Hold the pinion gear shaft to keep it from moving. Rotate the ring gear back and forth, and observe readout on dial indicator.

Specification

Ring Gear—Backlash..... 0.10—0.20 mm (0.004—0.008 in.)

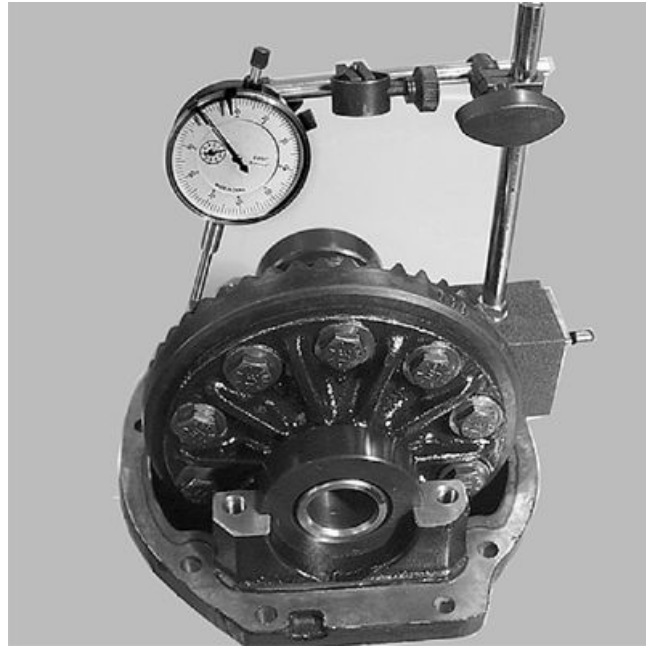
Results:

IMPORTANT: Avoid Damage! Whatever shim thickness is added to one side of the differential case must be removed from the other side. Or whatever shims are removed from one side must be added to the other to keep bearing preload from changing.

- If necessary, adjust backlash. Gear backlash is adjusted by changing the shim pack thickness on the ring gear side bearing. Removing shims increases backlash, adding shims decreases backlash.
- When backlash is correct, remove bearing substitute tools and install bearings.
- Install the bearing caps. Tighten the cap screws for the bearing caps to specification and recheck backlash.

Specification

Cap Screw—Torque..... 54—68 N·m (40—50 lb.-ft.)



Measure Ring Gear Movement

LVAL12410—UN—29OCT10

SW03989,0000C8A -19-16NOV10-4/4

PTO Clutch and Brake Theory of Operation

Function:

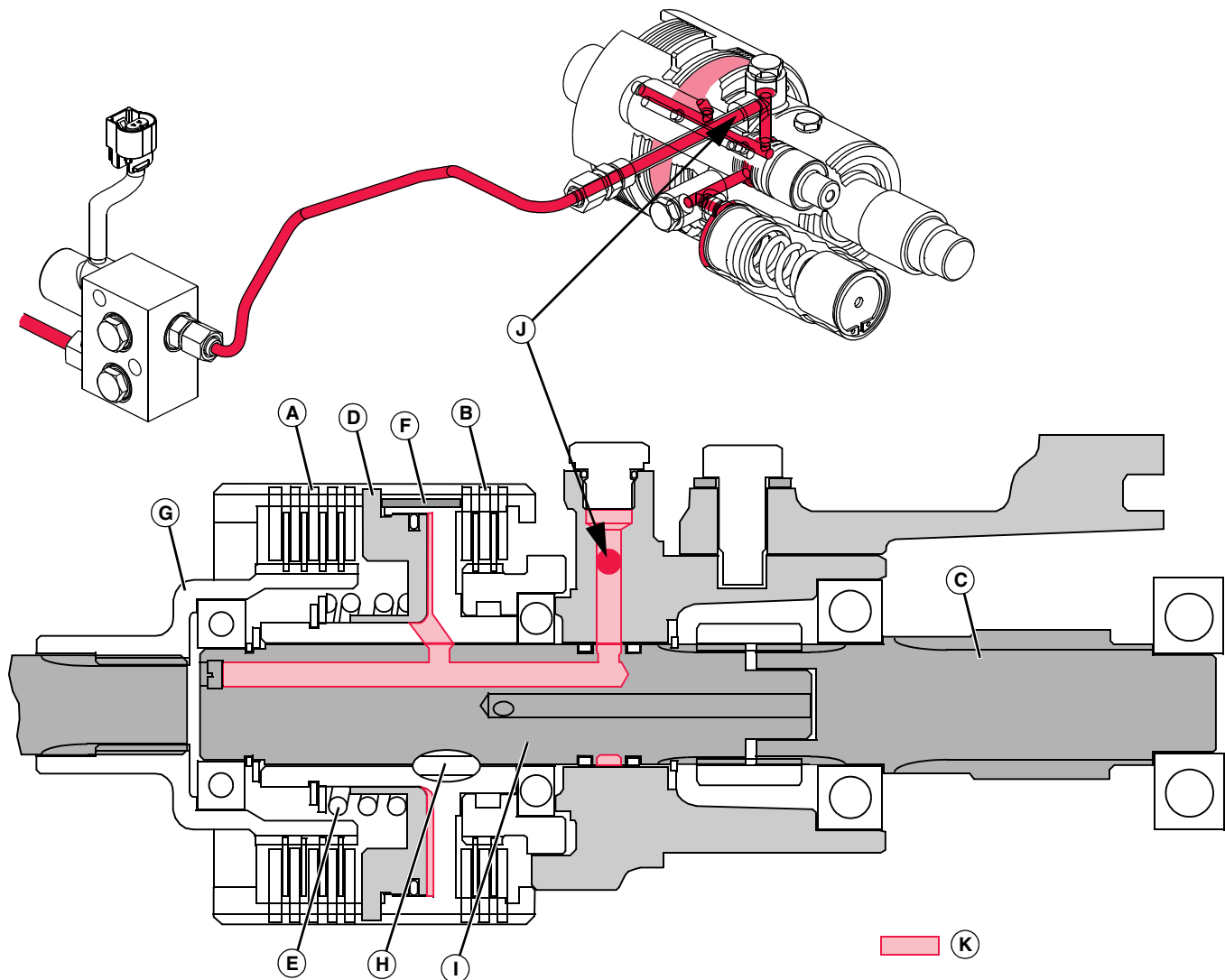
The PTO clutch provides a means for engaging and disengaging the PTO output shaft from the engine. The PTO brake is provided to positively stop the rotation of the PTO system when the PTO clutch is disengaged. The PTO clutch and PTO brake work simultaneously; if one is engaged, the other is disengaged. Both mid and rear PTO output shafts are affected by the operation of the PTO clutch and PTO brake.

Theory:

The PTO clutch (A) and PTO brake (B) are engaged or disengaged by the operator with the PTO switch. This switch operates the PTO solenoid valve mounted on the left side of the rear case.

The PTO brake contained inside the housing of the PTO clutch/brake unit is a spring loaded multi-plate wet brake and is normally engaged, preventing the PTO pinion shaft (C) from rotating. The PTO clutch is a multi-plate wet clutch and is normally disengaged.

When the PTO solenoid is energized, pressure oil flows behind the piston (D) in the PTO clutch housing. Piston action compresses the PTO clutch spring (E) and applies pressure to the clutch pack; at the same time releasing pressure on the interlock pins (F) and disengaging the PTO brake (B). Pressure applied to the clutch pack locks the disks (splined to the PTO hub (G)), to the friction plates (locked to the clutch housing). The clutch housing is keyed (H) to the clutch drive shaft (I). Power is transferred from the input shaft to the PTO hub, through the clutch plates and disks, to the clutch housing, and finally to the PTO drive shaft.



A—PTO Clutch
B—PTO Brake
C—PTO Pinion Shaft
D—Piston

E—PTO Clutch Spring
F—Interlock Pins
G—PTO Hub
H—Keyed, Clutch Housing

I—Clutch Drive Shaft
J—Pressure Oil Inlet (From PTO Valve)

K—PTO Clutch Pressure Oil

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SW03989.0000C8B -19-05NOV10-1/2

Power Transmission—Rear PTO

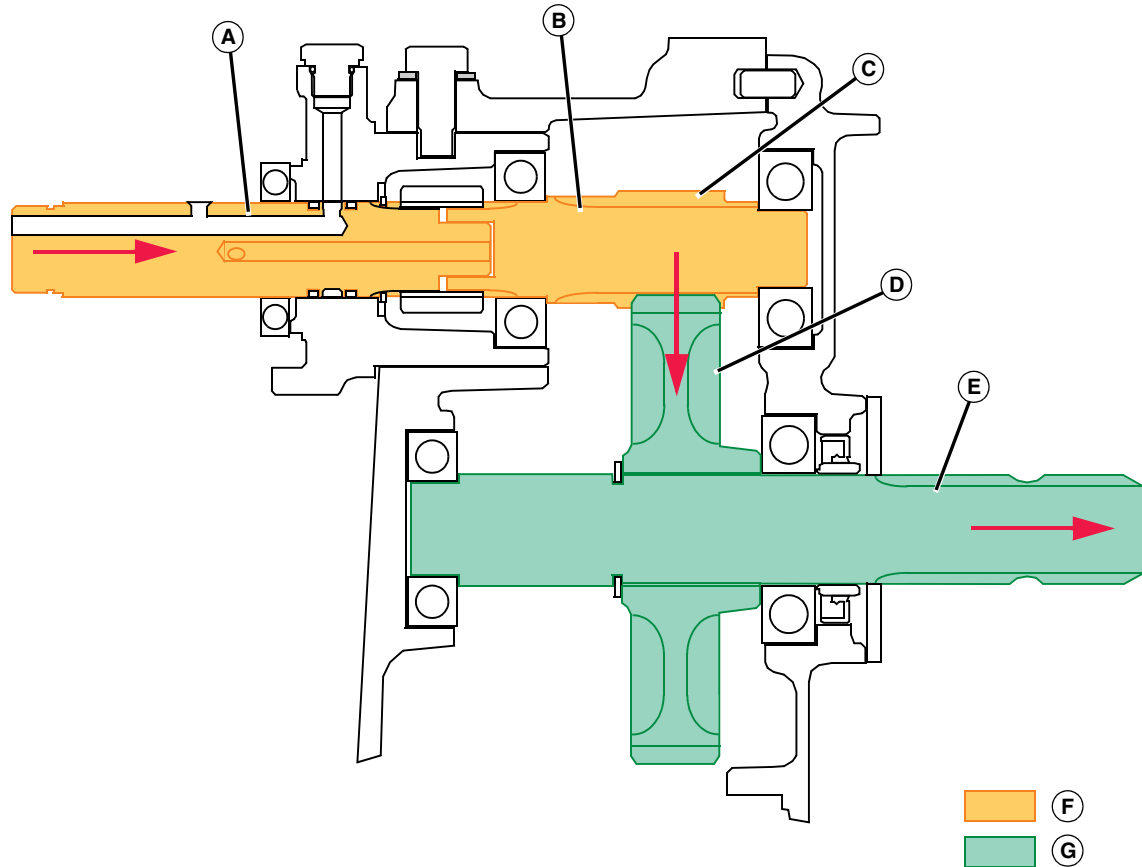
Function:

The rear PTO provides a means for transferring engine power to rear mounted attachments.

Theory:

Power is provided to the PTO gear power train through PTO clutch and PTO drive shaft (A). Power is not transferred until the operator engages the PTO solenoid. (See PTO Clutch and Brake Theory of Operation in

Section 80, Group 45.) The PTO drive shaft turns in a counterclockwise direction and is coupled directly to the PTO pinion shaft (B). The PTO pinion shaft is a shaft and gear (C) machined as a single part. This gear is in constant mesh with the gear (D) which is splined to the PTO stub shaft (E), and rotates in a clockwise direction. The rear PTO always turns clockwise when looking at the end of the PTO shaft from the rear of the machine. The rear PTO runs independently of the machine forward or rearward motion, or rate of travel. Speed of the PTO is dependent on engine RPM. The rear PTO is limited to 585 rpm at maximum engine speed.



A—PTO Drive Shaft
B—PTO Pinion Shaft

C—Shaft and Gear Single Part
D—Gear

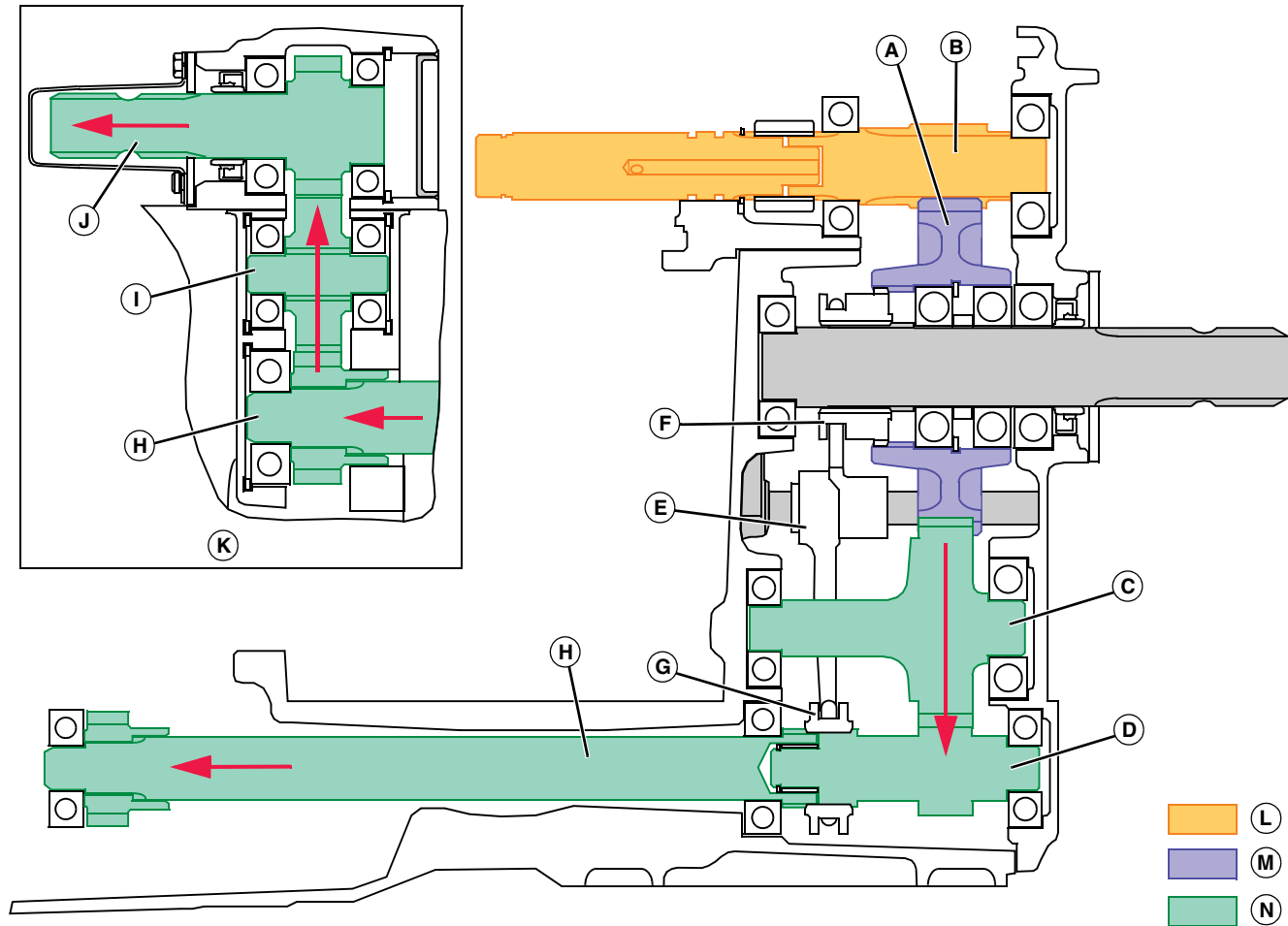
E—PTO Stub Shaft
F—Input Power

G—Rear PTO Power

LVAL12412 —UN—29OCT10

SW03989,0000C8C -19-11NOV10-1/1

Power Transmission—Mid PTO



- | | | | |
|---------------------------------|------------------------------|-------------------------------|------------------|
| A—Gear, 62T | E—Double Shift Fork Assembly | I— Idler Gear Shaft | M—Power Transfer |
| B—PTO Pinion Shaft | F—Rear PTO Shift Collar | J— Mid PTO Stub Shaft | N—Mid PTO Power |
| C—Mid PTO Idler Gear Shaft, 32T | G—Mid PTO Shift Collar | K—Mid PTO Case Shown from Top | |
| D—Lower Mid PTO Gear Shaft, 15T | H—Mid PTO Drive Shaft | L—Input Power | |

Function:

The mid PTO provides a means for transferring engine power to mid mount attachments such as a mower deck. It also provides a means for engaging and disengaging engine power to the mid PTO stub shaft.

Theory:

Power is not available to the rear PTO or mid PTO until the operator engages the PTO switch; which energizes the PTO solenoid. (See PTO Clutch and Brake Theory of Operation in Section 80, Group 45.) Power is provided to the rear and mid PTO through the 62 tooth gear (A) which rotates freely clockwise on bearings on the rear PTO stub shaft. The 62 tooth gear (A) is in constant mesh with the PTO pinion shaft (B) and the 32 tooth mid PTO idler gear shaft (C). The idler gear shaft (C) is also in constant mesh with the 15 tooth lower mid PTO gear shaft (D). Any time the PTO pinion shaft (B) is rotating, so is the lower mid PTO gear shaft (D).

A double shift fork assembly (E) is used to engage the rear PTO, mid PTO or both. The double shift fork slides the rear PTO shift collar (F) and the mid PTO shift collar (G) at the same time. The graphic below shows the rear PTO and the mid PTO both engaged. Shift collar (F) is splined to the rear PTO stub shaft. Shift collar (G) slides on the splines of the lower mid PTO gear shaft (D) and the mid PTO drive shaft (H).

When the operator selects the rear PTO only, rear PTO shift collar (F) moves to the rear and keeps the gear (A) coupled to the rear PTO stub shaft. The shift collar (G) also moves to the rear and uncouples the lower mid PTO gear shaft (D) from the mid PTO drive shaft (H).

When the operator selects the mid PTO only, the rear PTO shift collar (F) disengages from gear (A). The mid PTO shift collar (G) locks the lower mid PTO gear shaft (D) to the mid PTO drive shaft (H).

Continued on next page

SW03989,0000C8D -19-11NOV10-1/2

The mid PTO drive shaft (H) drives an idler gear shaft (I) in the mid PTO case. See the inset graphic below. The

idler gear shaft (I) is in constant mesh with the mid PTO drive shaft and the mid PTO stub shaft (J).

SW03989,0000C8D -19-11NOV10-2/2

PTO Drive Shaft and Gears

Removal:

1. Park machine on a level surface, shut off engine, and set park brake.
2. If necessary, remove center lift link, draft arms, and adjustable draft links.

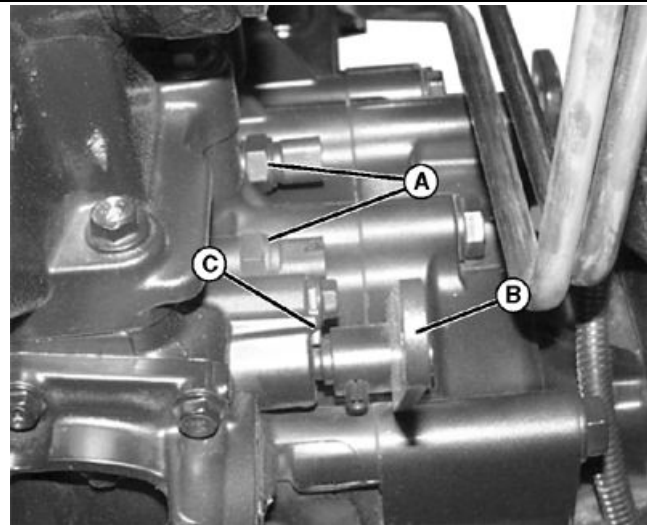
NOTE: Capacity of the hydraulic system is approximately 23.8 liters (6.3 gal) for PRT machines and 25.7 liters (6.8 gal) for eHydro™ machines.

3. Drain hydraulic oil from reservoir.
4. Remove rear PTO shield assembly.
5. For Machines with MID PTO:
 - Disconnect wiring harness from PTO switches (A).
 - Disconnect PTO shift linkage from PTO shift arm (B).
 - Remove bolt and retainer plate (C) from PTO shift arm (B).

IMPORTANT: Avoid Damage! Remove PTO switches (A) before moving PTO shift arm.

- Slide PTO shift arm as far out of transmission case as possible.

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A—PTO Switch(es)
B—PTO Shift Arm

C—Bolt and Retainer Plate

LVAL12414 —UN—29OCT10

SW03989,0000C8E -19-11NOV10-1/15

NOTE: Gear assembly may or may not come out of transmission case as a unit.

6. Remove all cap screws (D) securing PTO cover to transmission case. Gently pry around edges of cover. Wobble shaft and pull at the same time to remove rear cover, PTO stub shaft and gear.

Installation—Machines Without Mid PTO:

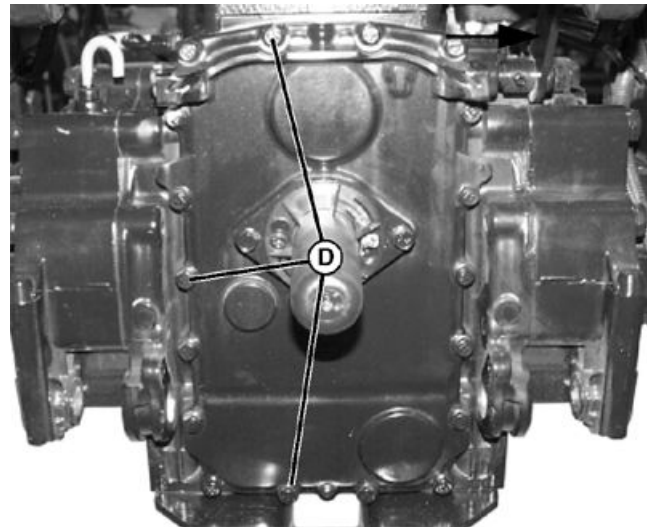
Installation is performed in the reverse order of removal.

- Thoroughly clean mating surfaces of rear cover and differential housing to remove all traces of old gasket.
- Install a new gasket on rear cover.
- Tighten retaining rear cover cap screws to specification.

Specification

Cap Screw—Torque..... 28 N·m (20 lb.-ft.)

D—Cap Screw (18 used)



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SW03989,0000C8E -19-11NOV10-2/15

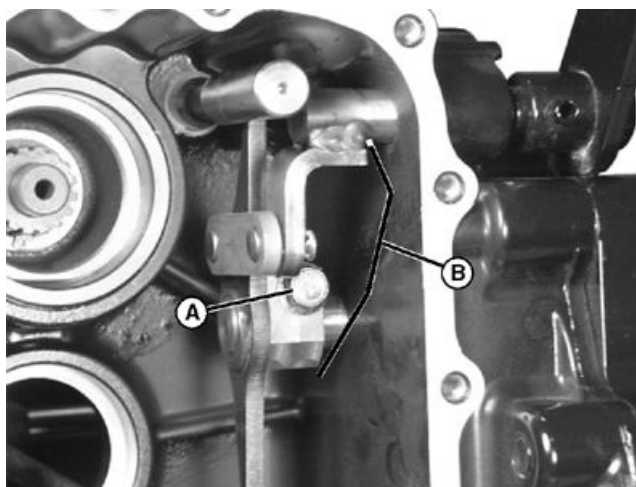
Installation—Machines With Mid PTO:

IMPORTANT: Avoid Damage! Replace all O-rings, gaskets, and seals. Used or damaged O-rings, gaskets, and seals will leak.

1. Remove bolt (A) from shift arm. Slide shift assembly (B) to the outside of transmission case as far as possible.

A—Bolt

B—Shift Assembly

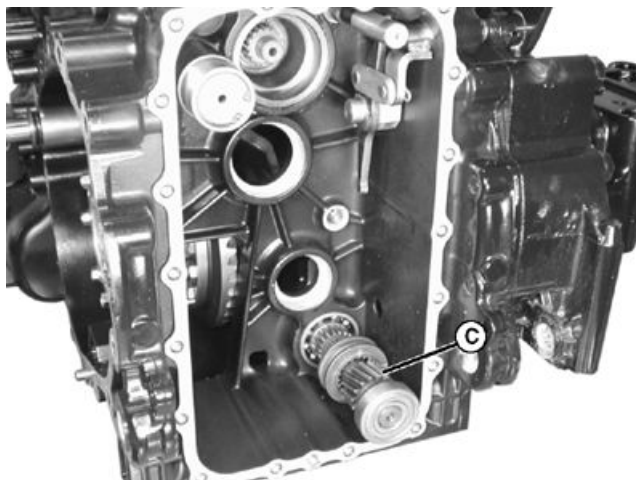


LVAL12416 —UN—29OCT10

SW03989,0000C8E -19-11NOV10-3/15

2. Loosely install mid PTO gear shaft assembly bearing (C) into case.

C—Bearing



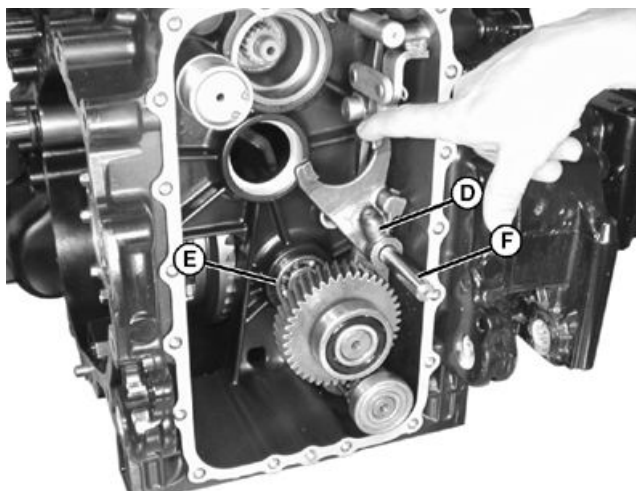
LVAL12417 —UN—29OCT10

SW03989,0000C8E -19-11NOV10-4/15

3. Place shift fork assembly (D) longer shift fork over mid PTO gear shaft collar, raise shorter shift fork up and loosely install idler gear shaft assembly bearing (E) into case. Do not seat shift fork shaft (F) into case.

D—Shift Fork Assembly
E—Bearing

F—Shift Fork Shaft



LVAL12418 —UN—29OCT10

Continued on next page

SW03989,0000C8E -19-11NOV10-5/15

NOTE: When installing PTO stub shaft and gear assembly, slide shift collar forward to ease installation.

4. Install PTO stub shaft assembly (G) into place ensuring that the shorter shift fork is seated into stub shaft assembly shift collar.
5. Seat stub shaft assembly bearing, and shift fork shaft (D) into transmission case bearing holes.

G—PTO Stub Shaft Assembly

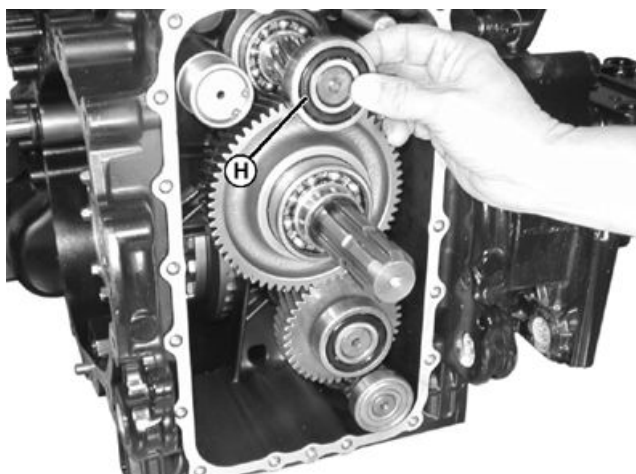


LVAL12419 —UN—29OCT10

SW03989,0000C8E -19-11NOV10-6/15

6. Install PTO pinion shaft assembly (H).
7. Carefully seat all shaft assemblies fully into case.

H—PTO Pinion Shaft Assembly



LVAL12420 —UN—29OCT10

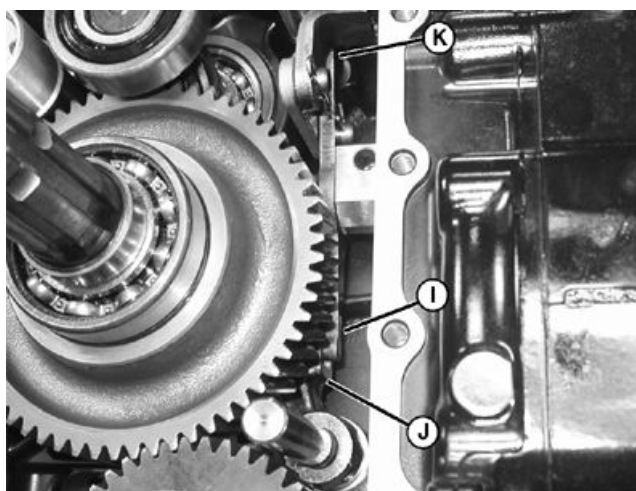
SW03989,0000C8E -19-11NOV10-7/15

8. Rotate shift lever until shift lever (I) aligns with fork notch (J) and switch shaft notch (K). Slide shift assembly into transmission case to seat shift lever into notches.

I— Shift Lever

J— Fork Notch

K—Switch Shaft Notch



LVAL12421 —UN—29OCT10

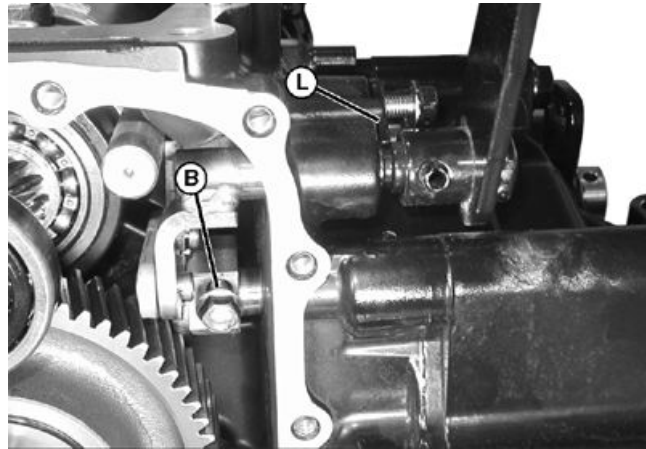
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SW03989,0000C8E -19-11NOV10-8/15

9. Apply thread lock compound to, and install bolt (B).
10. Install keeper plate (L) and secure with bolt.
11. Thoroughly clean mating surfaces of rear cover and differential housing to remove all traces of old gasket.
12. Replace PTO seal in rear cover.
13. Install a new gasket on rear cover.
14. Coat PTO rear plate bearing surfaces with clean oil. Carefully install plate ensuring that shafts and bearings are aligned with rear plate bearing surfaces.
15. Tighten retaining rear cover cap screws to specification.

Specification

Cap Screw—Torque..... 28 N·m (28 lb.-ft.)



B—Bolt

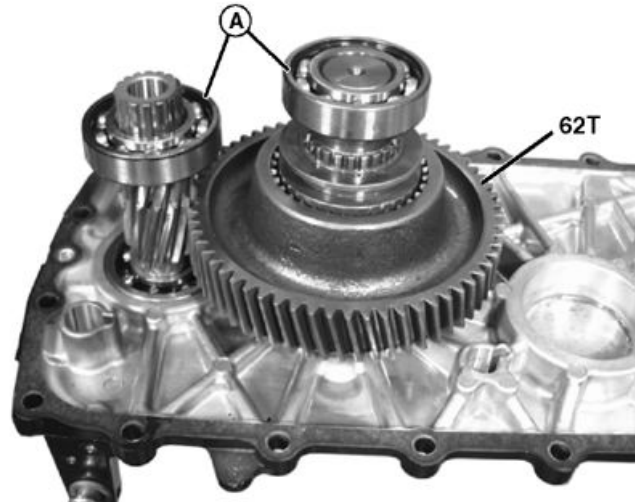
L—Keeper Plate

SW03989,0000C8E -19-11NOV10-9/15

LVAL12422 —UN—29OCT10

Disassembly:

1. Remove rear PTO drive shaft and gears as an assembly.
2. If not already done, remove coupler from PTO pinion shaft.
3. Using a suitable puller, remove bearings (A) from PTO pinion shaft and PTO stub shaft.
4. Inspect bearings for smooth operation, wear, or damage. Replace as necessary.
5. Machines without mid PTO: Remove snap ring and gear—62T.
6. Machines with mid PTO: Remove shift collar (B) from stub shaft.
7. Remove drive PTO stub shaft, rear bearing, and seal sleeve (toward inside of cover).



PTO Stub Shaft With Shift Collar (Mid PTO Machines Only)

A—Bearing (2 used)

62T— Gear, 62T

Continued on next page

SW03989,0000C8E -19-11NOV10-10/15

LVAL12423 —UN—29OCT10

8. Using a press or suitable driver, remove bearing (C) and seal sleeve (D) from PTO shaft. Remove thrust bearing (E).

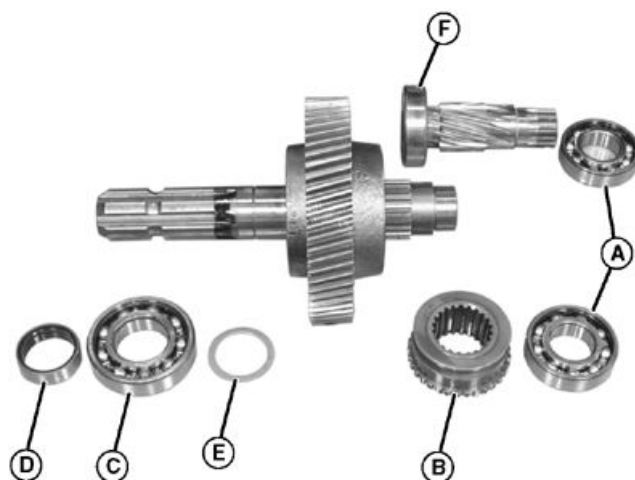
9. Remove bearing (F) from pinion shaft.

10. Inspect all bearings for smooth operation, wear, or damage. Replace as necessary.

11. Replace seal sleeve.

A—Bearing (2 used)
B—Shift Collar
C—Bearing

D—Seal Sleeve
E—Bearing, Thrust
F—Bearing



LVAL12424—UN—29OCT10

SW03989,0000C8E -19-11NOV10-11/15

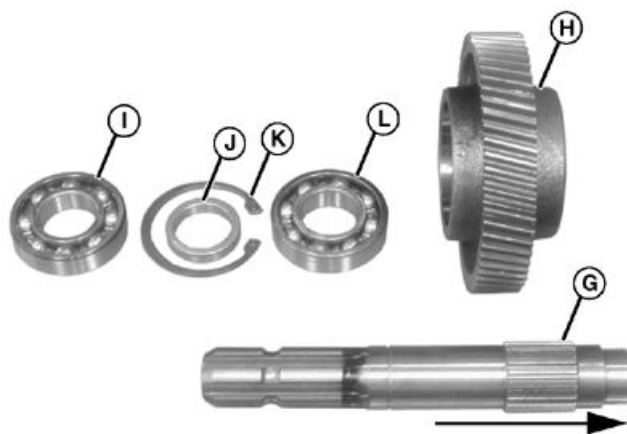
12. Press PTO stub shaft (G) out of 62T gear (H) and bearing assembly.

13. Remove bearing (I), spacer (J), snap ring (K), and remaining bearing (L) from 62T gear.

14. Inspect bearings for smooth operation, wear, or damage. Replace as necessary.

G—PTO Stub Shaft
H—Gear, 62T
I—Bearing

J—Spacer
K—Snap Ring
L—Bearing



LVAL12425—UN—29OCT10

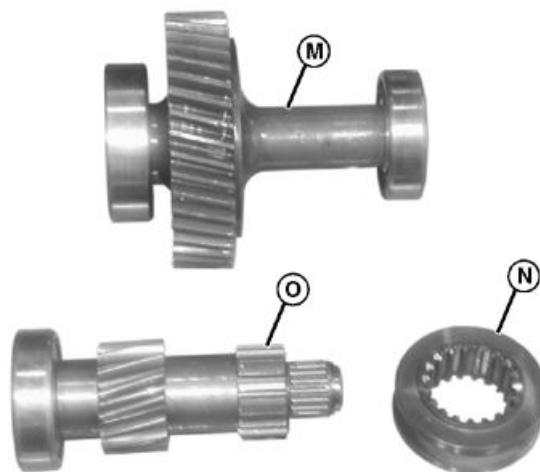
SW03989,0000C8E -19-11NOV10-12/15

15. Inspect bearings on idler shaft (M) for smooth operation, wear, or damage. Replace as necessary.

16. Remove shift collar (N) from lower mid PTO gear shaft (O). Inspect needle bearing and roller bearing on shaft for smooth operation, wear, or damage. Replace as necessary.

M—Idler Shaft
N—Shift Collar

O—Lower Mid PTO Gear Shaft



LVAL12426—UN—29OCT10

Continued on next page

SW03989,0000C8E -19-11NOV10-13/15

17. Remove two cap screws and oil seal plate (P).
18. Using a seal puller or suitable driver, remove seal (Q) from rear PTO cover.

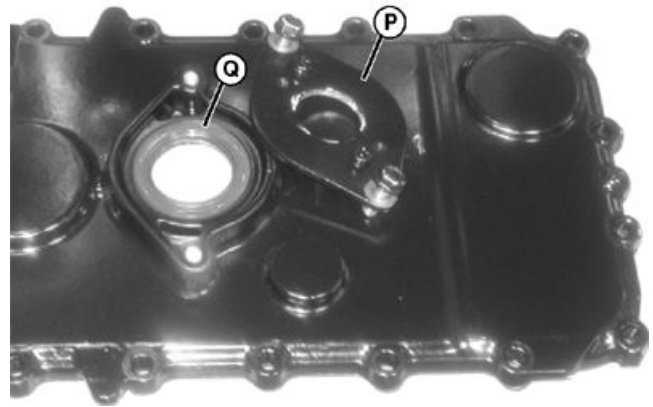
Assembly:

IMPORTANT: Avoid Damage! DO NOT spin bearing using compressed air. Damage to bearing balls, cage, and races could result.

IMPORTANT: Avoid Damage! Use liberal amounts of transmission oil to lubricate components as they are assembled. DO NOT use grease or other heavy lubricants unless they are specifically called for in the assembly story.

NOTE: Before beginning assembly, be sure that all components are clean, and in good condition.

1. Clean mating surface of rear cover to remove old gasket material.
2. Using a suitable driver, install new PTO shaft seal (Q) in PTO cover. Install oil seal plate (P).



P—Oil Seal Plate

Q—Seal

LVAL12427—UN—29OCT10

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SW03989,0000C8E -19-11NOV10-14/15

3. Assemble gear shaft assemblies.

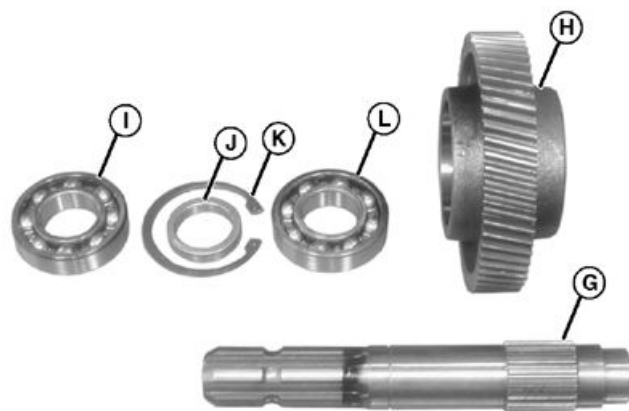
- Install bearing (L), snap ring (K), spacer (J), and remaining bearing (I) on to 62T gear.
- Press PTO stub shaft (G) into 62T gear (H) and bearing assembly.
- Install thrust bearing (E). Using a press or suitable driver, install bearing (C) and new seal sleeve (D) onto PTO shaft.
- Install shift collar (B) onto shaft. Press bearing (A) onto shaft.
- Press bearing onto PTO pinion shaft (F).

NOTE: Check shafts to ensure that they are properly installed in transmission case; if bearings are not fully seated in case, PTO cover may break when installed onto transmission housing and attaching cap screws are tightened.

4. Install shaft and bearing assemblies into transmission case. (See PTO Drive Shaft and Gears in Section 80, Group 50.)

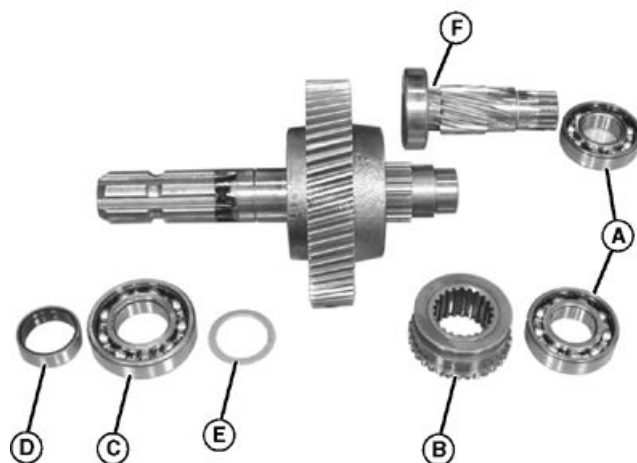
A—Bearing (2 used)
B—Shift Collar
C—Bearing

D—Seal Sleeve
E—Bearing, Thrust
F—Bearing



G—PTO Stub Shaft
H—Gear, 62T
I—Bearing

J—Spacer
K—Snap Ring
L—Bearing



LVAL12428—UN—29OCT10

LVAL12429—UN—29OCT10

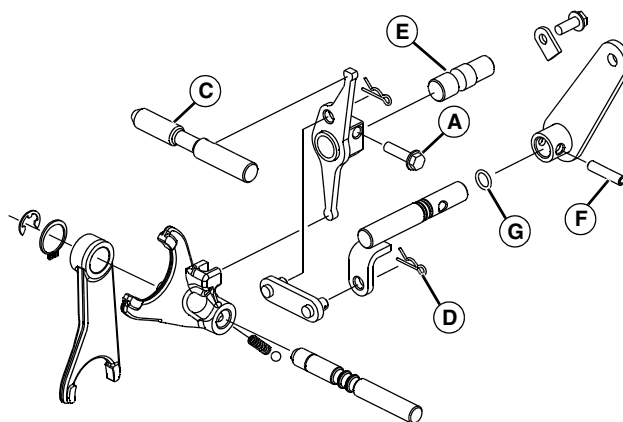
SW03989,0000C8E -19-11NOV10-15/15

Rear and Mid PTO Shifter

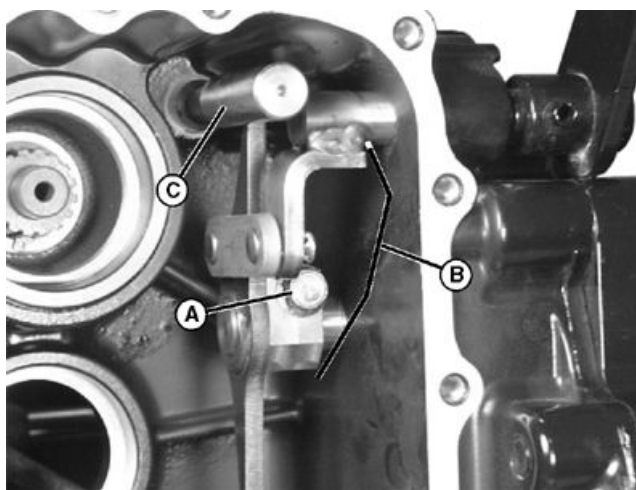
1. Remove bolt (A) from shift arm. Slide shift assembly (B) to the outside of transmission case as far as possible.
2. Remove switch shaft (C).

A—Bolt
B—Shift Assembly
C—Switch Shaft

D—Spring Pin
E—Shaft
F—Roll Pin



LVAL12430 —UN—29OCT10



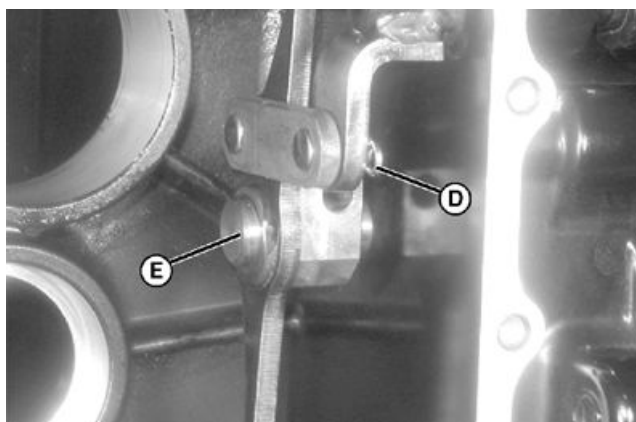
LVAL12431 —UN—29OCT10

SW03989,0000C8F -19-05NOV10-1/3

3. Remove spring pin (D).
4. Remove shaft (E) from transmission case.

D—Spring Pin

E—Shaft



LVAL12432 —UN—29OCT10

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SW03989,0000C8F -19-05NOV10-2/3

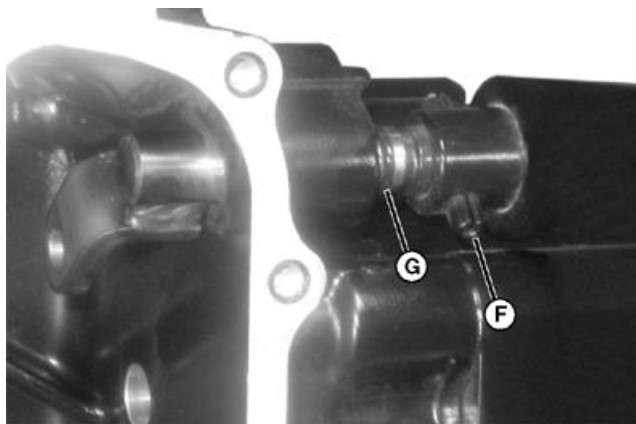
5. Remove roll pin (F).
6. Slide shift shaft out of transmission case.

Installation is performed in the reverse order of removal.

- Replace O-ring (G).
- Apply thread lock to bolt (A) before installation.
- Install shift shaft retainer plate.

F—Roll Pin

G—O-ring



LVAL12433—UN—29OCT10

SW03989,0000C8F -19-05NOV10-3/3

PTO Clutch and Brake

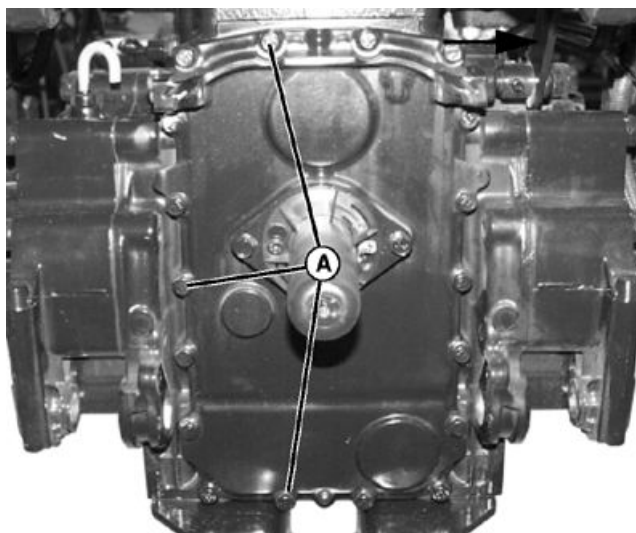
Removal:

1. Split machine at rear of tunnel to access PTO clutch shaft. (See Machine Splitting (Rear), in Section 70, Group 40.)
2. Remove rockshaft. (See Rockshaft Removal and Installation, in Section 90, Group 34.)

NOTE: Gear assembly may or may not come out of transmission case as a unit.

3. Remove all cap screws (A) securing PTO cover to transmission case. Gently pry around edges of cover. Wobble shaft and pull at the same time to remove rear cover, PTO stub shaft, and gear.

A—Cap Screw (18 used)



LVAL12434—UN—02NOV10

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SW03989,0000C90 -19-11NOV10-1/10

4. Remove snap ring securing front of PTO clutch drive shaft assembly (B).

5. Slide PTO clutch drive shaft assembly (B) forward.

NOTE: Retainer bolt is installed with thread lock applied.

6. Remove retainer bolt (C).

7. Slide PTO clutch assembly (D) forward and remove from transmission case.

Installation:

Installation is the reverse of removal.

- Coat PTO clutch retainer bolt threads with thread lock. Tighten to specification.

Specification

PTO Clutch Retainer

Bolt—Torque..... 45—58 N·m (33—43 lb.-ft.)

- Install PTO clutch assembly (D) and install PTO clutch drive shaft assembly (B).
- Replace PTO seal in rear cover.
- Install a new gasket on rear cover.
- Coat PTO rear plate bearing surfaces with clean oil. Carefully install plate ensuring that shafts and bearings are aligned with rear plate bearing surfaces.
- Tighten retaining PTO rear cover cap screws to specification.

Specification

PTO Rear Cover Cap

Screw—Torque..... 28 N·m (20 lb.-ft.)

PTO Clutch Disassembly:

Special or Essential Tools:

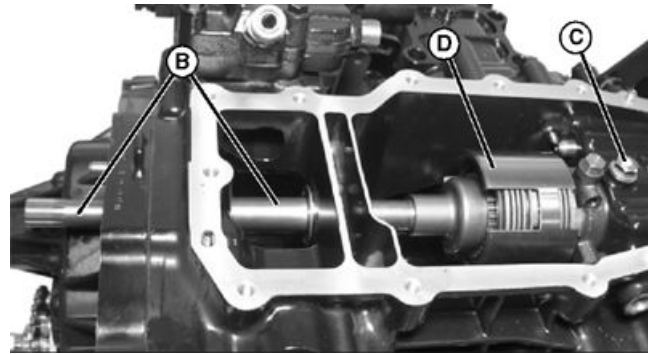
- JDG1169 Clutch Spring Compressor

1. Remove clutch hub (A) from clutch cylinder.
2. Remove large internal snap ring (B) from PTO clutch housing.
3. Remove clutch plates and disks (C) from clutch cylinder.

A—Clutch Hub

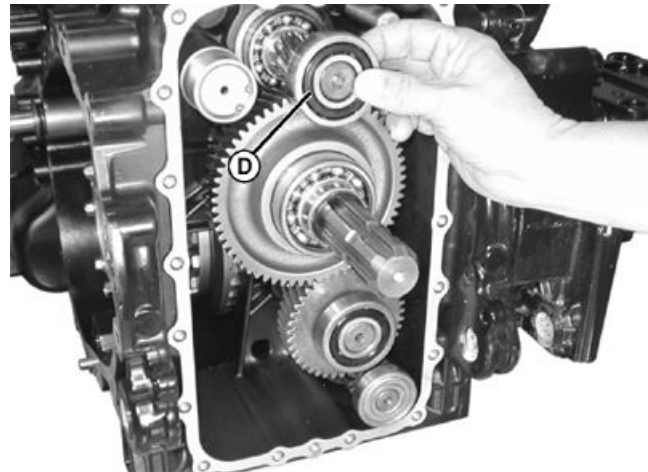
B—Internal Snap Ring

C—Clutch Plates And Disks

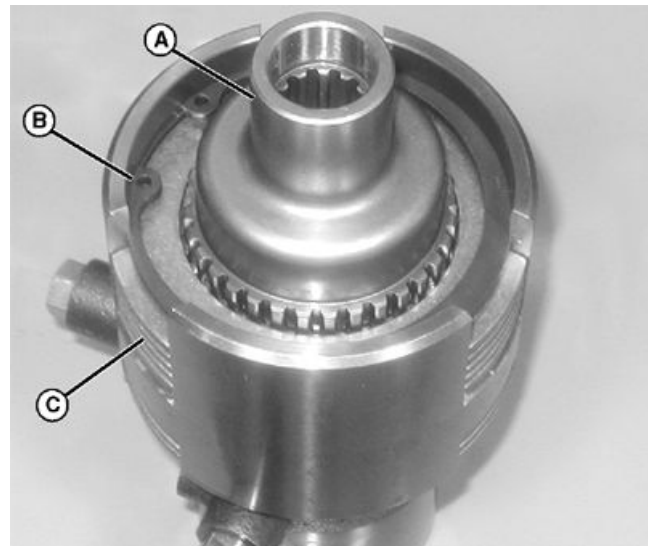


B—PTO Clutch Drive Shaft Assembly
C—Bolt

D—PTO Clutch Assembly



PTO and Mid PTO Gears Shown



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SW03989,0000C90 -19-11NOV10-2/10

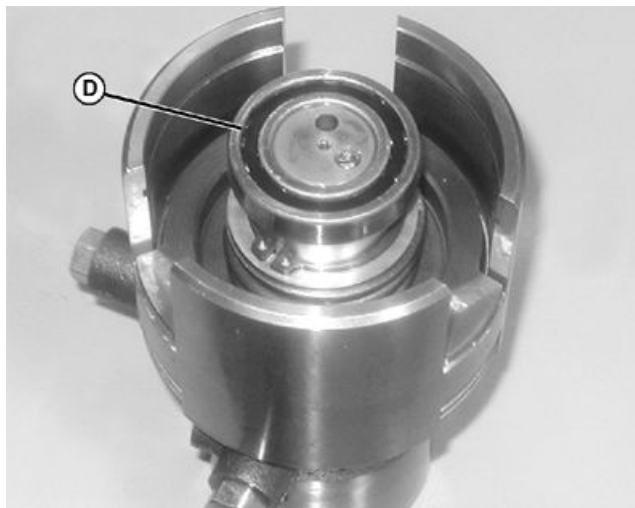
LVAL12435 —UN—02NOV10

LVAL12436 —UN—02NOV10

LVAL12437 —UN—02NOV10

4. Remove bearing (D) from PTO shaft.
5. Inspect bearing for smooth operation, wear, or damage. Replace as necessary.

D—Bearing

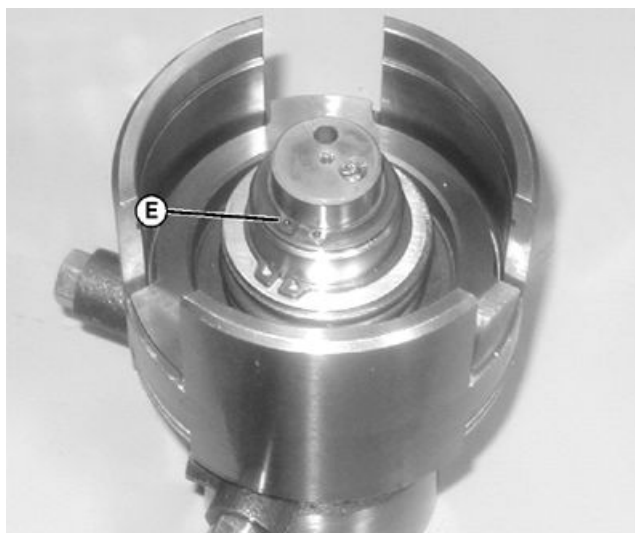


LVAL12438 —UN—02NOV10

SW03989,0000C90 -19-11NOV10-3/10

6. Remove snap ring (E) and thrust washer from PTO shaft.

E—Snap Ring



LVAL12439 —UN—02NOV10

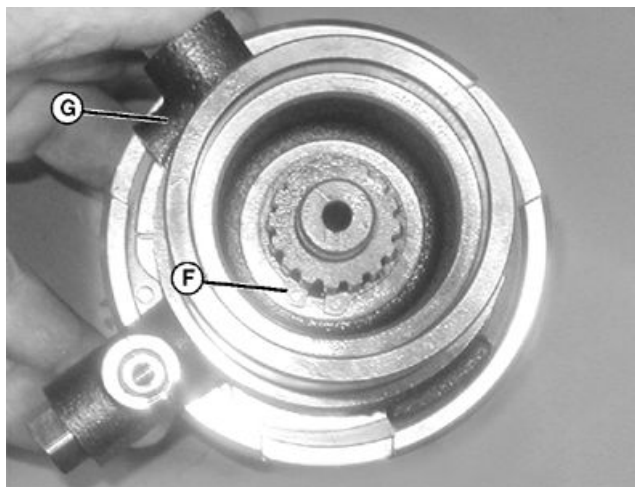
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SW03989,0000C90 -19-11NOV10-4/10

7. Remove snap ring (F) from PTO shaft.
8. Remove PTO adapter housing (G) from PTO assembly.

F—Snap Ring

G—PTO Adapter Housing



LVAL12440—UN—02NOV10

SW03989,0000C90 -19-11NOV10-5/10

9. Remove PTO shaft (G) and bearing assembly from clutch cylinder.

NOTE: Apply grease to seals when installing.

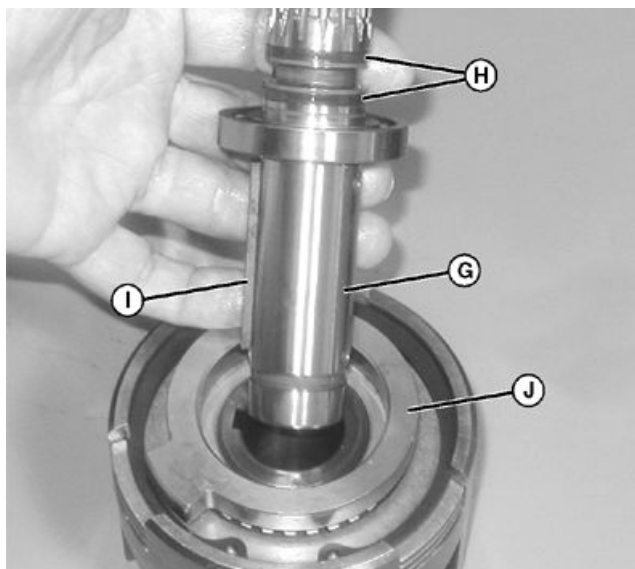
10. Remove and replace PTO shaft seals (H).
11. Remove key (I) from groove in shaft. Inspect key for shearing. Replace as necessary.
12. Inspect bearing for smooth operation, wear, or damage. Replace as necessary.
13. Remove brake clutch hub (J).

G—PTO Shaft

H—PTO Shaft Seals

I—Key

J—Brake Clutch Hub



LVAL12441—UN—02NOV10

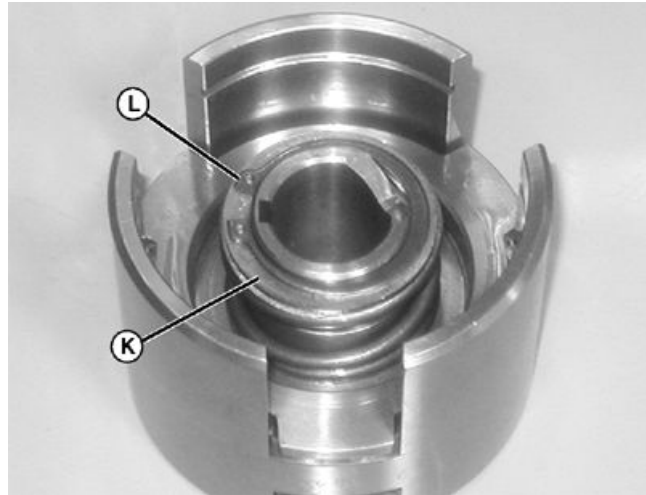
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SW03989,0000C90 -19-11NOV10-6/10

14. Place JDG1169 Clutch Spring Compressor over washer (K) in clutch.
15. Using a press, compress spring and remove external snap ring (L) from groove. Slowly release spring compression.

K—Washer

L—External Snap Ring



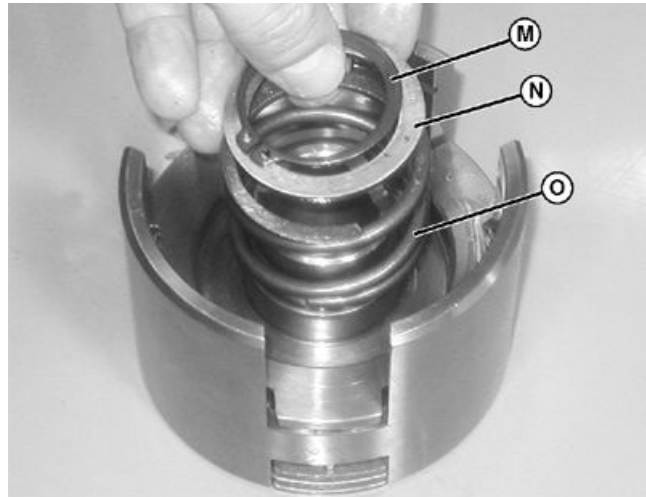
LVAL12442 —UN—02NOV10

SW03989,0000C90 -19-11NOV10-7/10

16. Remove external snap ring (M), washer (N) and spring (O).

M—External Snap Ring
N—Washer

O—Spring



LVAL12443 —UN—02NOV10

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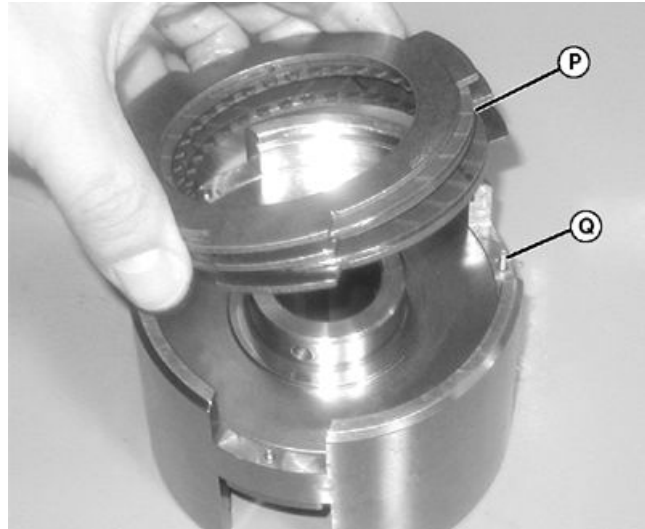
SW03989,0000C90 -19-11NOV10-8/10

NOTE: When piston is removed, interlock pins (R) will fall out of clutch housing. Use care to avoid losing pins.

17. Remove snap ring and brake plates (P) from clutch housing. Be careful not to drop or lose three interlock pins (Q).
18. Inspect end plate, separator plates and friction plates for wear, discoloration, scoring or warping. Measure plate thickness. If plate(s) do not meet minimum plate thickness specification, replace clutch plate pack as a unit.

Specification

End Plate—Thickness (minimum).....	3.05 mm (0.120 in.)
Friction Plates—Thick- ness (minimum).....	2.15 mm (0.084 in.)
Disks—Thickness (minimum).....	1.9 mm (0.075 in.)



P—Brake Plates

Q—Interlock Pin (3 used)

SW03989,0000C90 -19-11NOV10-9/10

LVAL12444 —UN—02NOV10

19. Remove piston (R).
 20. Remove three interlock pins (Q).
- NOTE:** Apply grease to O-ring when installing.
21. Replace O-ring (S) in outer groove of piston.
 22. Measure interlock pins. If pins do not meet length specification, replace pins as a set.

Specification

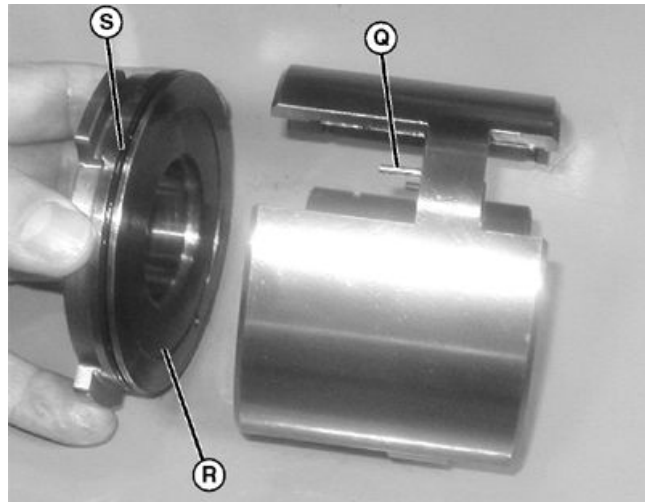
Pin—Length.....	19.5 mm (0.768 in.)
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PTO Clutch Assembly:

IMPORTANT: Avoid Damage! Soak clutch and brake disks in hydraulic oil for one (1) hour before assembling clutch or brake packs. Failure to complete this step will result in premature clutch failure.

Assembly is performed in the reverse order of disassembly.

- Apply grease to packings and seal lips when installing.
- Replace piston O-ring.
- Replace PTO shaft seals.



Q—Interlock Pin (3 used)
R—Piston

S—O-ring

- Install PTO clutch assembly.

SW03989,0000C90 -19-11NOV10-10/10

LVAL12445 —UN—02NOV10

Mid PTO

Removal:

1. Split machine at rear of tunnel to access PTO clutch shaft. (See Machine Splitting (Rear). in Section 70, Group 40.)
2. Park machine on a level surface, shut off engine, and set park brake.
3. If necessary, remove center lift link, draft arms, and adjustable draft links.

NOTE: Capacity of the hydraulic system is approximately 23.8 liters (6.3 gal.) for PRT machines and 25.7 liters (6.8 gal.) for eHydro™ machines.

4. Drain hydraulic oil from reservoir.

Specification

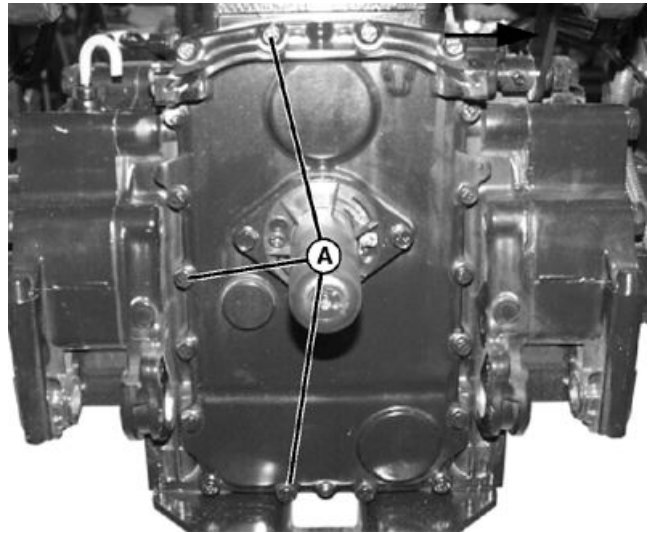
PRT Hydraulic
Reservoir—Capacity..... 23.8 liters (6.3 gal.)

Specification

eHydro™ Hydraulic
Reservoir—Capacity..... 25.7 liters (6.8 gal.)

5. Remove rear PTO shield assembly.
6. Remove all cap screws (A) securing PTO cover to transmission case. Gently pry around edges of cover.

eHydro is a trademark of Deere & Company



A—Cap Screw (18 used)

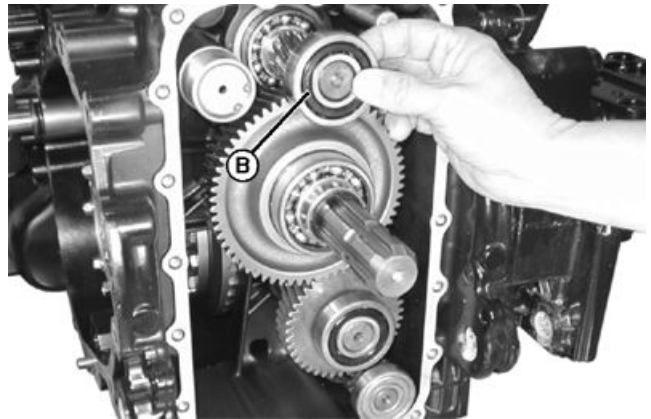
Wobble shaft and pull at the same time to remove rear cover, PTO stub shaft, and gear.

LVAL12446 —UN—02NOV10

SW03989,0000C91 -19-12NOV10-1/12

7. Remove PTO pinion shaft assembly (B).

B—PTO Pinion Shaft Assembly



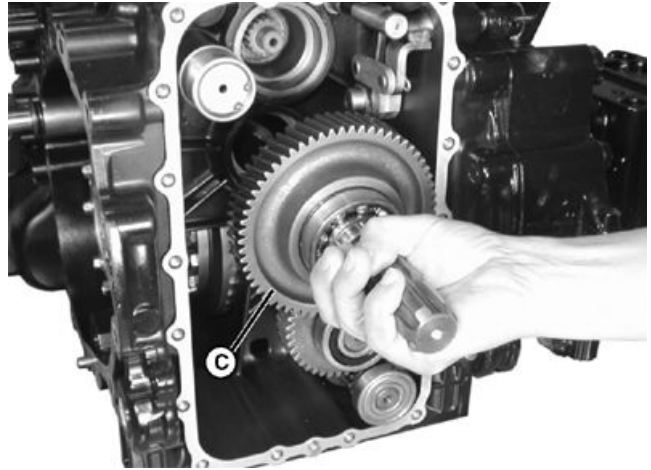
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SW03989,0000C91 -19-12NOV10-2/12

LVAL12447 —UN—02NOV10

8. Remove PTO stub shaft assembly (C).

C—PTO Stub Shaft Assembly



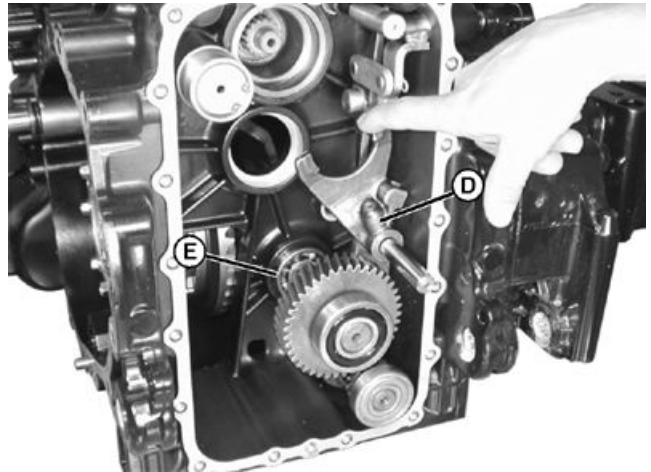
LVAL12448 —UN—01NOV10

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9. Hold up shift fork assembly (D) and remove idler gear shaft assembly bearing (E).

D—Shift Fork Assembly

E—Bearing

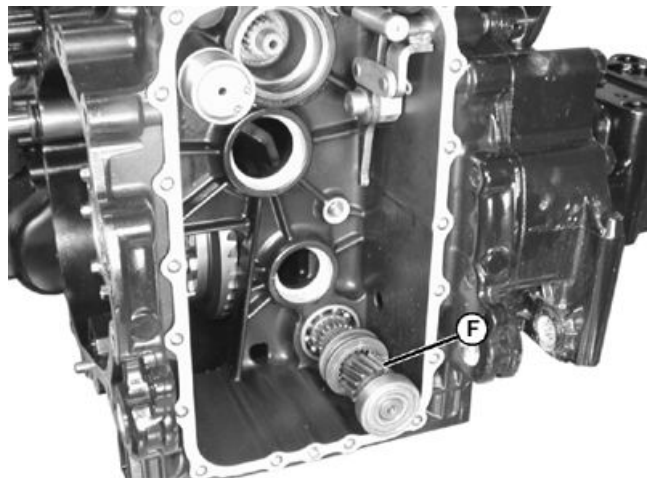


LVAL12449 —UN—02NOV10

SW03989,0000C91 -19-12NOV10-4/12

10. Remove mid PTO gear shaft assembly (F).

F—Mid PTO Gear Shaft Assembly



LVAL12450 —UN—01NOV10

Continued on next page

SW03989,0000C91 -19-12NOV10-5/12

11. Carefully drive mid PTO shaft (G) toward rear of transmission until it is clear of mid PTO bearing. Remove shaft from transmission housing.
12. Inspect mid PTO shaft bearings for wear or damage. Replace if necessary.
13. Remove four cap screws (H) and mid PTO housing from transmission housing.

Installation:

Installation is the reverse of removal. For PTO gear shaft installation, (See PTO Drive Shaft and Gears in Section 80, Group 50.)

- Apply grease to packings and seal lips when installing.
- Install mid PTO cover to transmission housing. Tighten cap screws to specification.

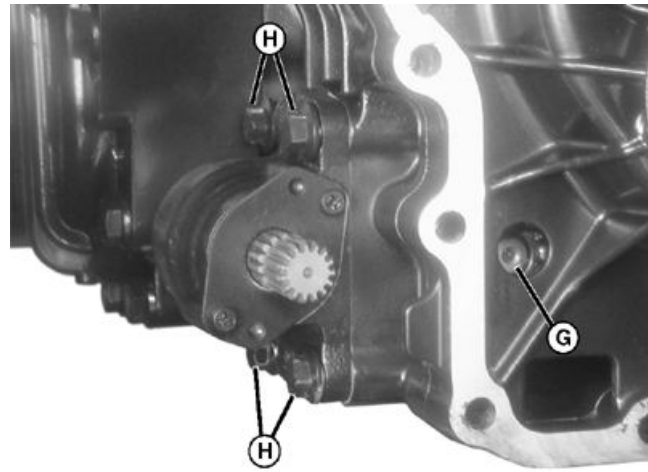
Specification

Cap Screw—Torque..... 45—50 N·m (33—37 lb.-ft.)

- Replace mid PTO to transmission housing gasket.
- Install mid PTO shaft and four cap screws to specification.

Specification

Cap Screw—Torque..... 80 N·m (59 lb.-ft.)



G—Mid PTO Shaft

H—Cap Screw (4 used)

NOTE: Replace O-rings. Old O-rings will leak.

LVAL12451 —UN—01NOV10

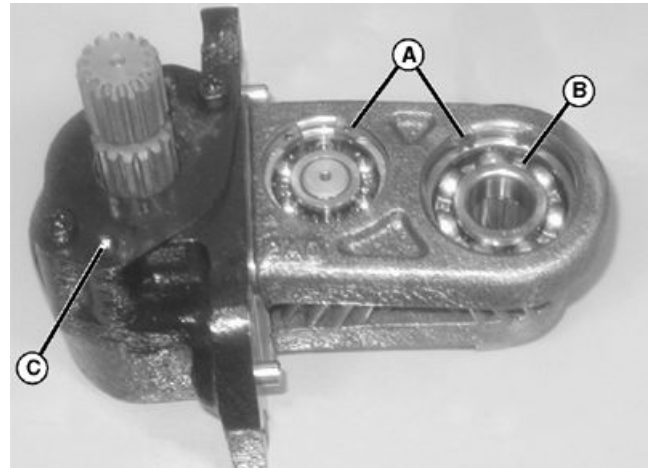
SW03989,0000C91 -19-12NOV10-6/12

Disassembly and Assembly

1. Remove snap rings (A).
2. Remove bearing and gear (B).
3. Remove two screws and seal plate (C).
4. Inspect bearings for wear or damage. Replace if necessary.

A—Snap Ring (2 used)
B—Bearing

C—Screws and Seal Plate



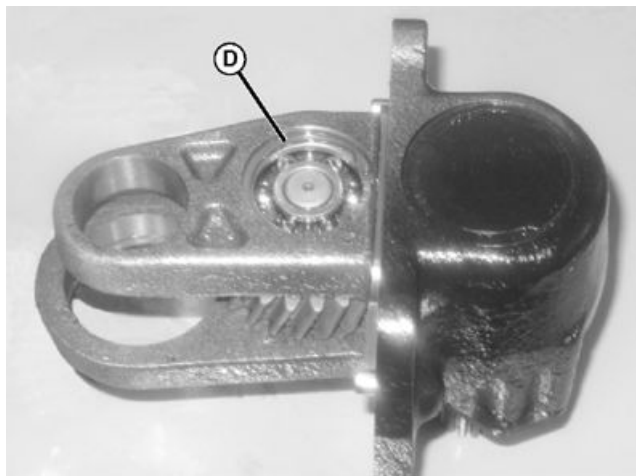
LVAL12452 —UN—01NOV10

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SW03989,0000C91 -19-12NOV10-7/12

5. Remove snap ring (D).

D—Snap Ring



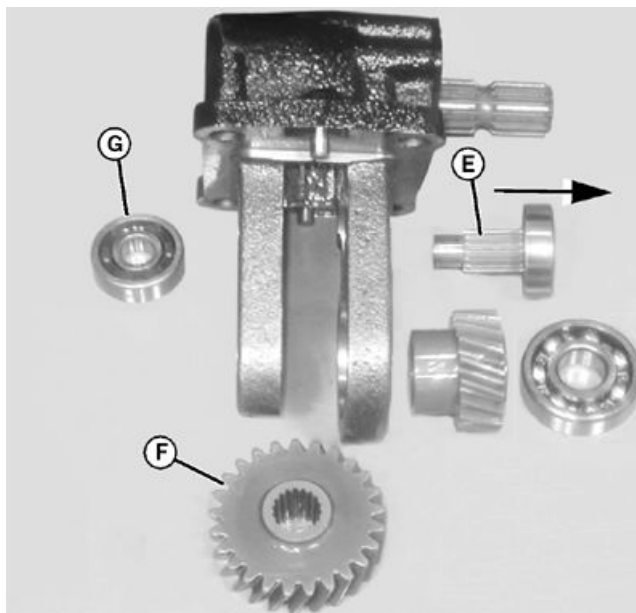
LVAL12453 —UN—01NOV10

SW03989,0000C91 -19-12NOV10-8/12

6. Remove shaft and bearing (E) and gear (F).
7. Remove remaining bearing (G).
8. Inspect bearings for wear or damage. Replace if necessary.

E—Shaft And Bearing
F—Gear

G—Bearing



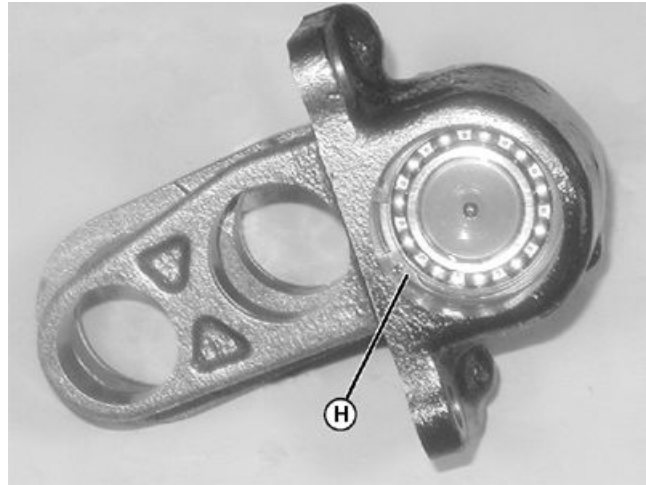
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9. Remove cover seal to expose mid PTO stub shaft.
Remove snap ring (H).
10. Remove stub shaft and bearing assembly from case.

H—Snap Ring



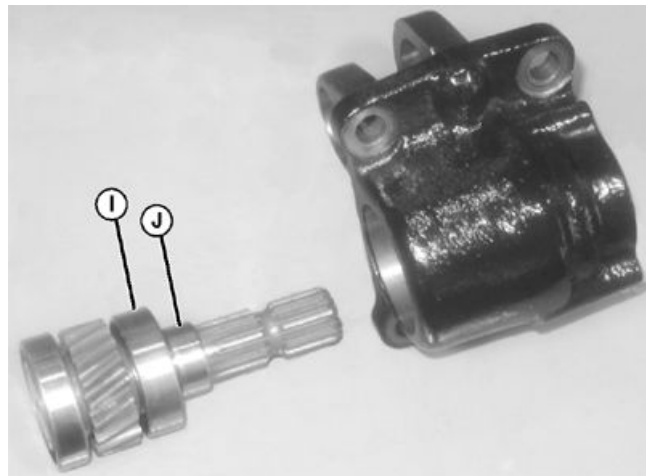
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11. Using an edge puller, remove bearing (I) and seal sleeve (J) from stub shaft. Replace seal sleeve before assembly.
12. Inspect bearings for wear or damage. Replace if necessary.

I— Bearing

J— Seal Sleeve



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Continued on next page

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13. Remove and replace shaft seal (K).

Assembly:

NOTE: Liberally lubricate all press fit parts with hydraulic oil to aid assembly.

Assembly is performed in the reverse order of disassembly.

- Apply grease to packing and seal lips when installing.
- Replace shaft seal.
- Replace cover seal.
- Install mid PTO shaft and four bolts to specification.

Specification

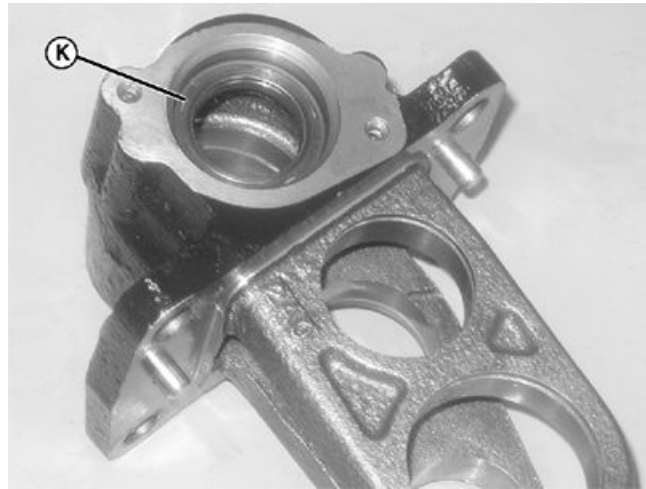
Bolt—Torque..... 80 N·m (59 lb.-ft.)

- Apply thread lock to seal plate screws. Tighten seal plate screws to specification.

Specification

Seal Plate

Screw—Torque..... 3 N·m (26.5 lb.-in.)



K—Seal

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Hydraulic Specifications

Item	Measurement	Specification
Hydraulic Specifications:		
Hydraulic Oil	Type	John Deere J20D
	Capacity (PowrReverser™ Machines)	23.8 L (6.3 gal.)
	Capacity (eHydro™ Machines)	25.7 L (6.8 gal.)
Item	Measurement	Specification
All Machines (at Rated Engine rpm):		
Rated Engine Speed	rpm	2600
System	Pressure	17240 kPa (2500 psi)
Steering Relief	Pressure	10 340 kPa (1500 psi)
Steering Pump	Capacity	20 L/min (5.3 gpm)
Steering Pump	Displacement	9 cm ³ /rev (0.549 cu in./rev)
Implement Pump	Capacity	32.5 L/min (8.6 gpm)
Implement Pump	Displacement	14.6 cm ³ /rev (0.891 cu in./rev)
Total Pump	Flow	
Pump	Type	Gear
Item	Measurement	Specification
PowrReverser™ Machines:		
Clutch	Pressure (at high idle)	965—1206 kPa (145—175 psi)
Clutch	Pressure (maximum)	2000 kPa (290 psi)
Filter Bypass	Pressure	250 kPa (38 psi)
Lube Relief	Pressure	300 kPa (44 psi)
Item	Measurement	Specification
eHydro™ Machines:		
System Regulated	Pressure	1800 kPa (261 psi)
Pump	Size	51 cm ³ /rev (3.1 cu in./rev)
Motor	Size	43.5 cm ³ /rev (2.65 cu in./rev)
Loop	Pressure	38470 kPa (5580 psi)
Charge	Pressure	1800 kPa (261 psi)
Charge Pressure Variable Oil	Temperature (cold / hot)	1515 / 2000 kPa (220 / 290 psi)
Pump	Type	PV Axial Piston
eHydro™ Motor	Type	MF Axial Piston
Item	Measurement	Specification
Rockshaft and Lift Arms:		
Lift Cycle	Time	2-1/2 to 3 seconds
Drop Cycle	Time	2-1/2 to 3 seconds
Lift Arm Drop in 5 minutes with Rate of Drop/Stop Valve Closed	Distance (Maximum)	51 mm (2 in.)

Continued on next page

SW03989,0000C92 -19-15NOV10-1/2

Specifications

Item	Measurement	Specification
Lift Arm Raise	Angle	50°
Lift Arm Lower	Angle	20°
Total Lift Arm Range	Angle	70°
Variance Between Lift Arms	Angle	5° Maximum
Item	Measurement	Specification
PTO Clutch:		
Clutch Hydraulic	Pressure (Full Throttle)	860—1380 kPa (125—200 psi)
Clutch Hydraulic (PRT)	Pressure (Full Throttle-maximum)	1800 kPa (261 psi)
Clutch Hydraulic (eHydro™)	Pressure (Full Throttle-maximum)	2000 kPa (290 psi)

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eHydro is a trademark of Deere & Company

SW03989,0000C92 -19-15NOV10-2/2

Repair Specifications

Item	Measurement	Specification
Rockshaft Specifications		
Splined Sleeve	OD (minimum)	46.5 mm (1.832 in.)
Bushing	ID (maximum)	44.2 mm (1.738 in.)
Item	Measurement	Specification
Gear Pump		
Shaft Bushing	ID (maximum)	19.15 mm (0.754 in.)
Shaft Bearing Surface	OD (minimum)	18.95 mm (0.746 in.)
Steering Bushing (front)	Thickness (minimum)	13.57 mm (0.534 in.)
Implement Bushing (rear)	Thickness (minimum)	19.02 mm (0.749 in.)
Front Pump Drive/Idler Gear (steering)	Thickness (minimum)	9.43 mm (0.371 in.)
Rear Implement Pump	Thickness	17.63 mm (0.694 in.)

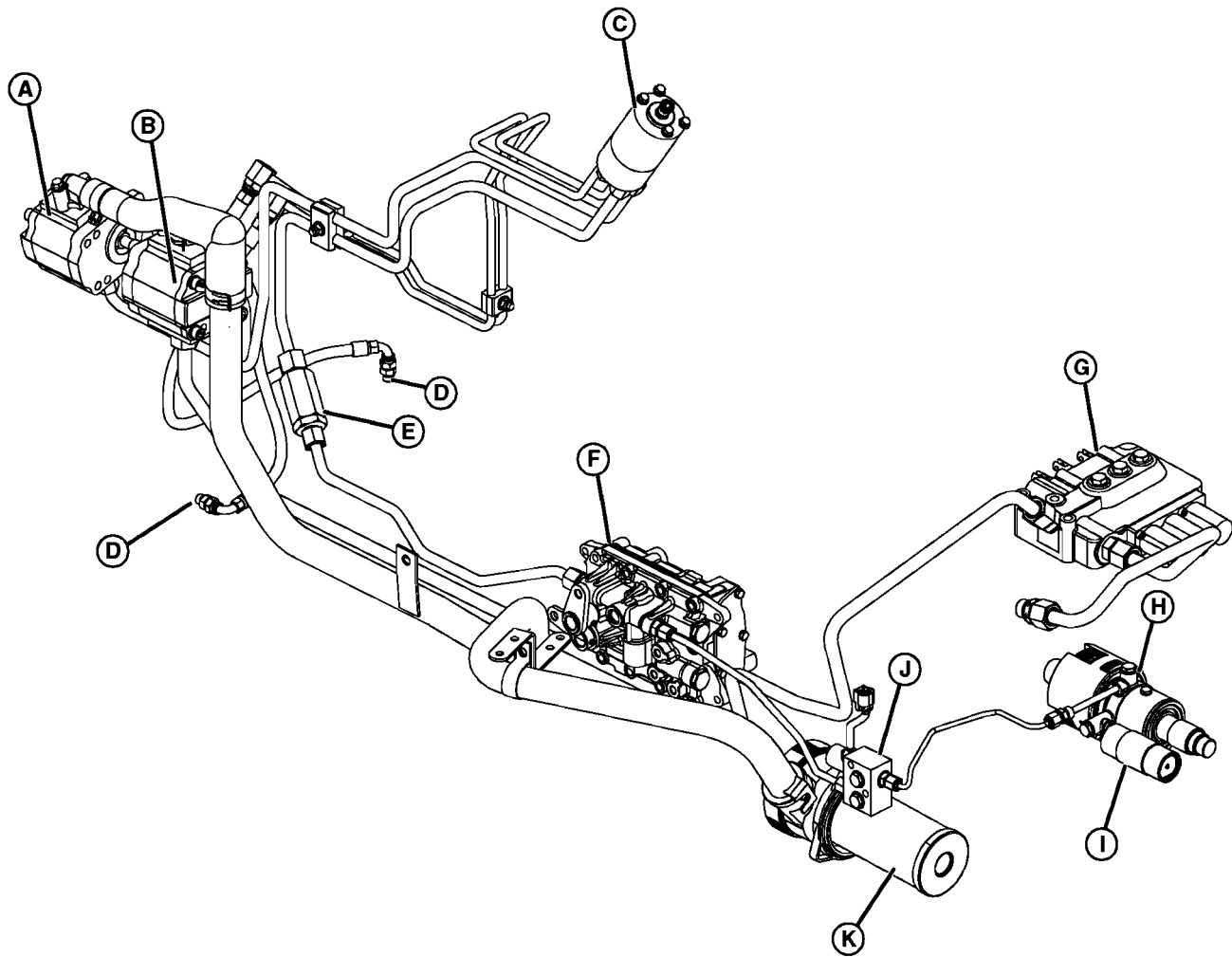
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Torque Specifications

Item	Measurement	Specification
General:		
J-Tube Nut (SCV or Manifold Block to Rockshaft)	Torque	81—89 N·m (60—67 lb.-ft.)
SCV Tube to Quick Disconnect Coupler	Torque	51—57 N·m (38—42 lb.-ft.)
SCV Work Port Tubes to Adaptor Fitting	Torque	51—57 N·m (38—42 lb.-ft.)
Tube Nut to Rockshaft Filter	Torque	28 N·m (21 lb.-ft.)
Manifold Block, or SCV Valve to Tunnel Cap Screw	Torque	63 N·m (47 lb.-ft.)
Adapter Fitting to Pump (Front Pump)		21 N·m (180 lb.-in.)
Pump to SCU Tube Nut (Front Gear Pump)	Torque	50 N·m (37 lb.-ft.)
Suction Tube Elbow Cap Screw (Front Gear Pump)	Torque	9 N·m (84 lb.-in.)
Adapter Fitting to Pump (Rear Gear Pump)	Torque	28 N·m (21 lb.-ft.)
Pump to SCV Tube Nut (Rear Gear Pump)	Torque	69 N·m (51 lb.-ft.)
Pump to Mounting Plate Cap Screw (Front or Rear Gear Pump)	Torque	22 N·m (192 lb.-in.)
Pump Cover M8 Cap Screw	Torque	28 N·m (240 lb.-in.)
Pump Cover M10 Cap Screw	Torque	55 N·m (40 lb.-ft.)
Rockshaft (10.9) Cap Screw	Torque	80 N·m (60 lb.-ft.)
Rockshaft (8.8) Cap Screw	Torque	55 N·m (40 lb.-ft.)
Rockshaft Cylinder Head Cap Screw	Torque	80 N·m (60 lb.-ft.)
Lift Arm to Splined Shaft Cap Screw	Torque	68 N·m (50 lb.-ft.)
Rockshaft Control Valve-to-Rockshaft Housing Cap Screw	Torque	39 N·m (29 lb.-ft.)
Item	Measurement	Specification
SVC Torque Specifications		
Cover Socket Head Cap Screw	Torque	19 N·m (168 lb.-in.)
Valve Spring Retainer Plug	Torque	15 N·m (133 lb.-in.)
Load Check Valve	Torque	24 N·m (212 lb.-in.)
Relief Valve	Torque	50 N·m (37 lb.-ft.)
Lever Assembly Cap Screw	Torque	40 N·m (30 lb.-ft.)

SW03989,0000C94 -19-05NOV10-1/1

Steering System Components, PowrReverser™



A—Gear Pump, Steering (Front)
B—Gear Pump, Implement (Rear)
C—Power Steering Valve

D—Connectors to Steering
Cylinder
E—Charge Pressure In-Line Filter
F—PRT Control Valve Assembly

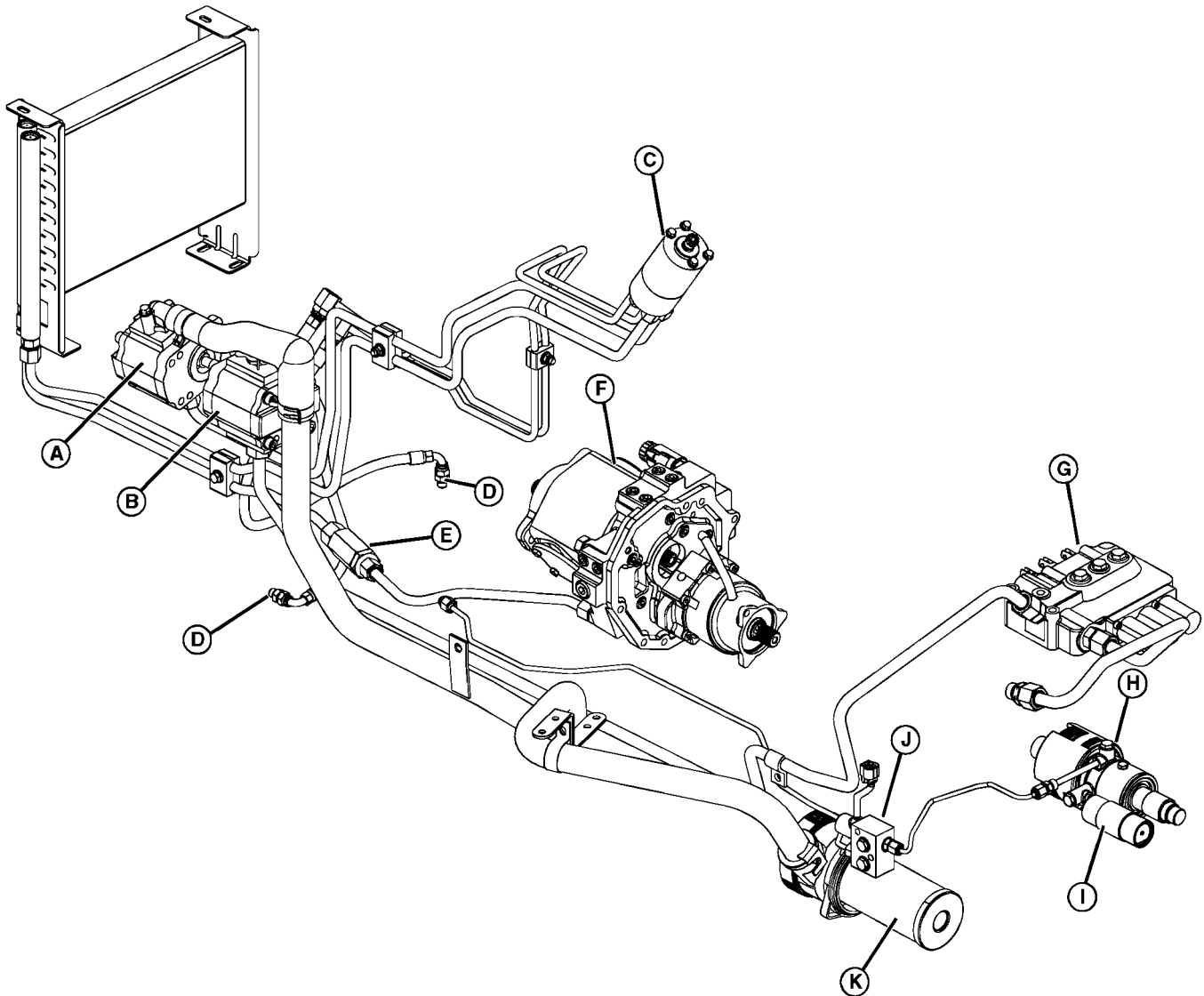
G—SCV (3-spool shown)
H—PTO Clutch
I—Accumulator
J—PTO Solenoid Valve

K—Suction Filter

LVAL12458 —UN—12NOV10

SW03989,0000C95 -19-05NOV10-1/1

Steering System Components, eHydro™

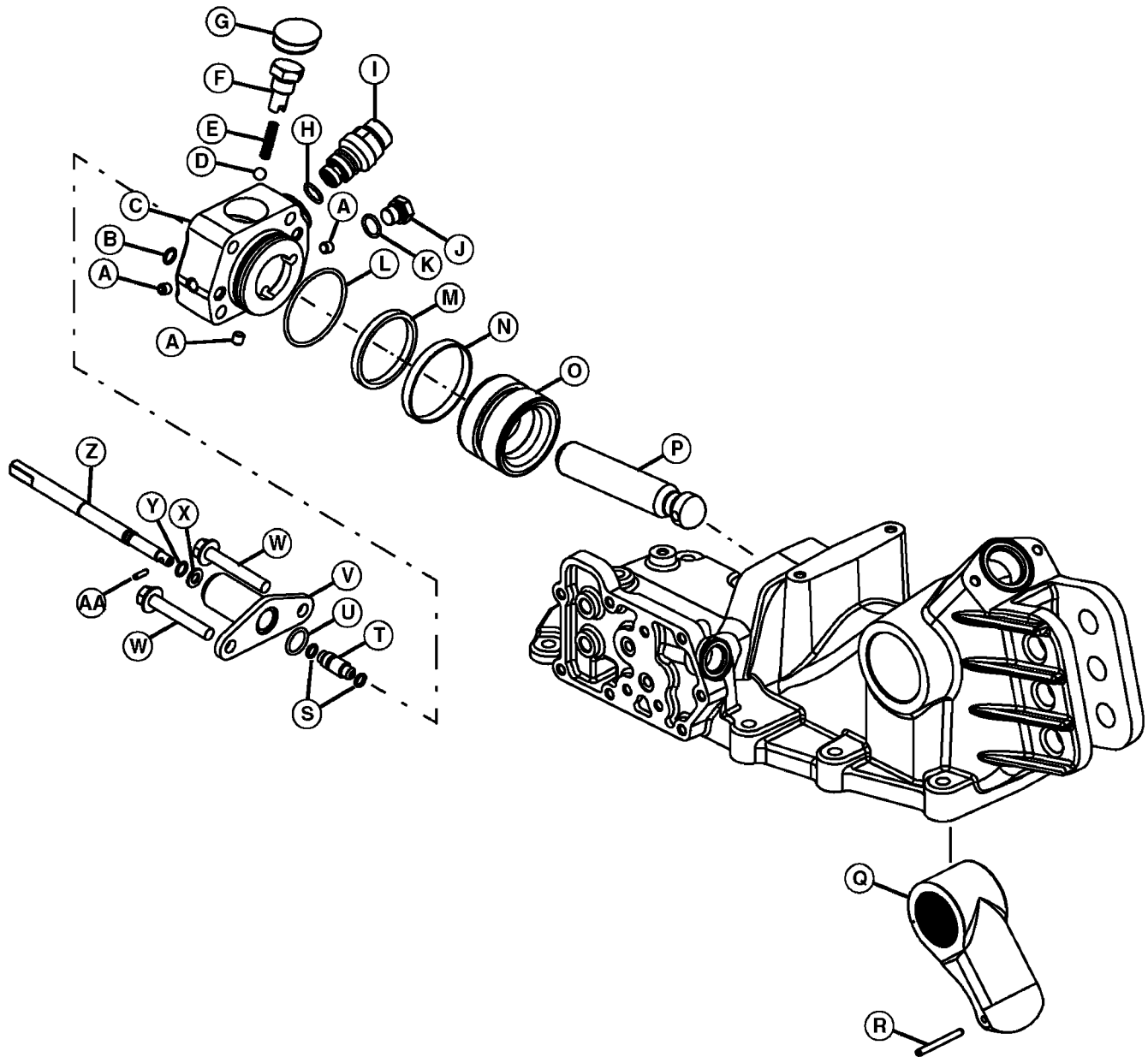


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|-------------------------------|-----------------------------------|-----------------------|------------------|
| A—Gear Pump, Steering (Front) | D—Connectors to Steering Cylinder | G—SCV (3-spool shown) | K—Suction Filter |
| B—Gear Pump, Implement (Rear) | E—Charge Pressure In-Line Filter | H—PTO Clutch | |
| C—Power Steering Valve | F—Hydrostatic Transmission | I—Accumulator | |
| | | J—PTO Solenoid Valve | |

LVAL12461 —UN—12NOV10

SW03989,0000C96 -19-05NOV10-1/1

Rockshaft Piston, Rod, and Rate of Drop Valve



A—Plug (3 used)
 B—O-ring
 C—Cover, Cylinder head
 D—Ball
 E—Spring
 F—Plug
 G—Cap

H—O-ring
 I— Valve, Relief
 J— Plug
 K—O-ring
 L—O-ring
 M—Slip Ring
 N—Seal
 O—Piston

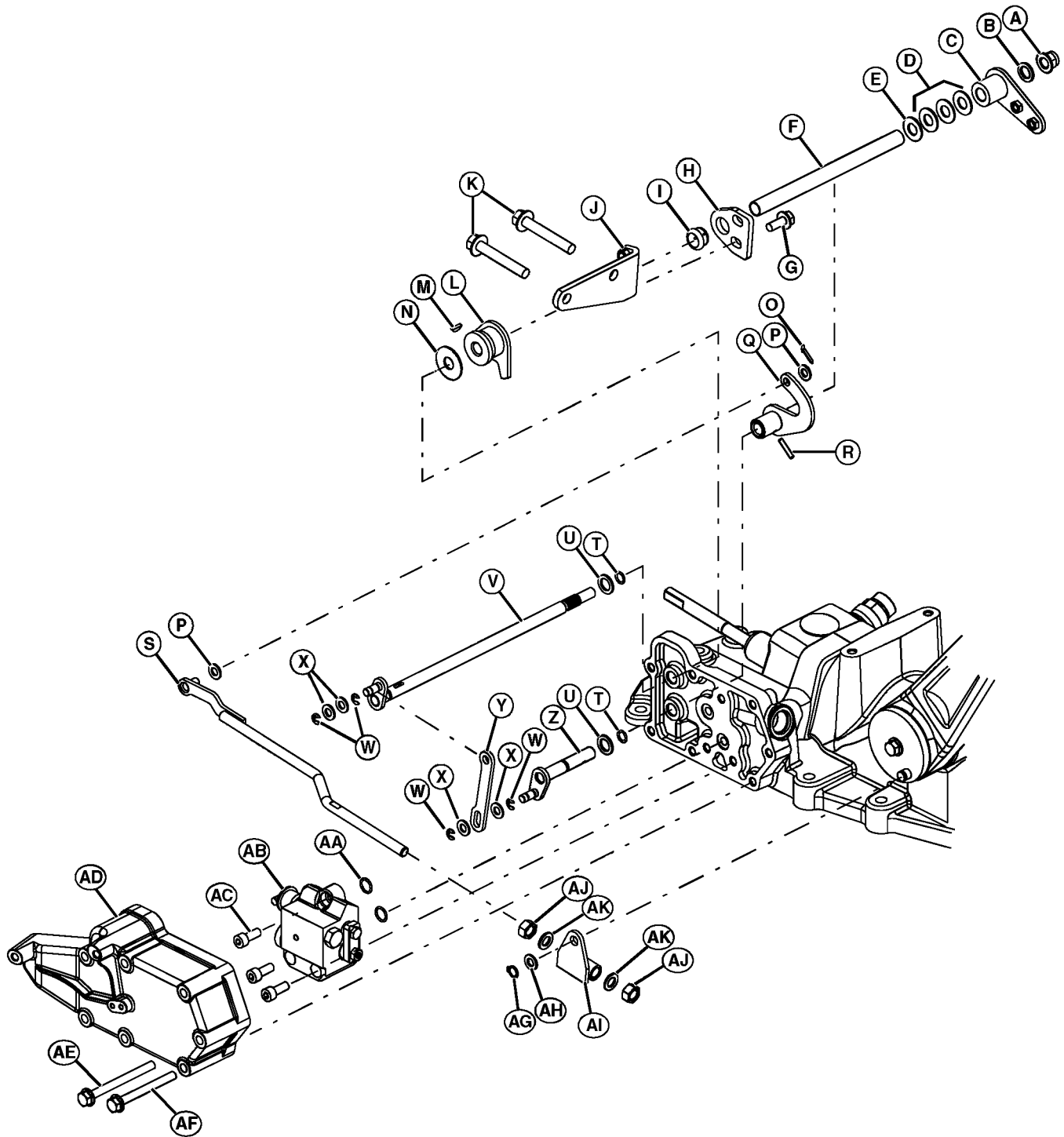
P—Rod
 Q—Arm, Crank
 R—Pin
 S—O-ring
 T— Valve Spool
 U—O-ring
 V—Stem Housing
 W—Flange Screw (2 used)

X—Washer
 Y—O-ring
 Z— Stem, Valve
 AA—Pin

LVAL12464 —UN—12NOV10

SW03989,0000C97 -19-05NOV10-1/1

Rockshaft Control Valve, Plunger Assembly and Controls



LVAL12465 —UN—12NOV10

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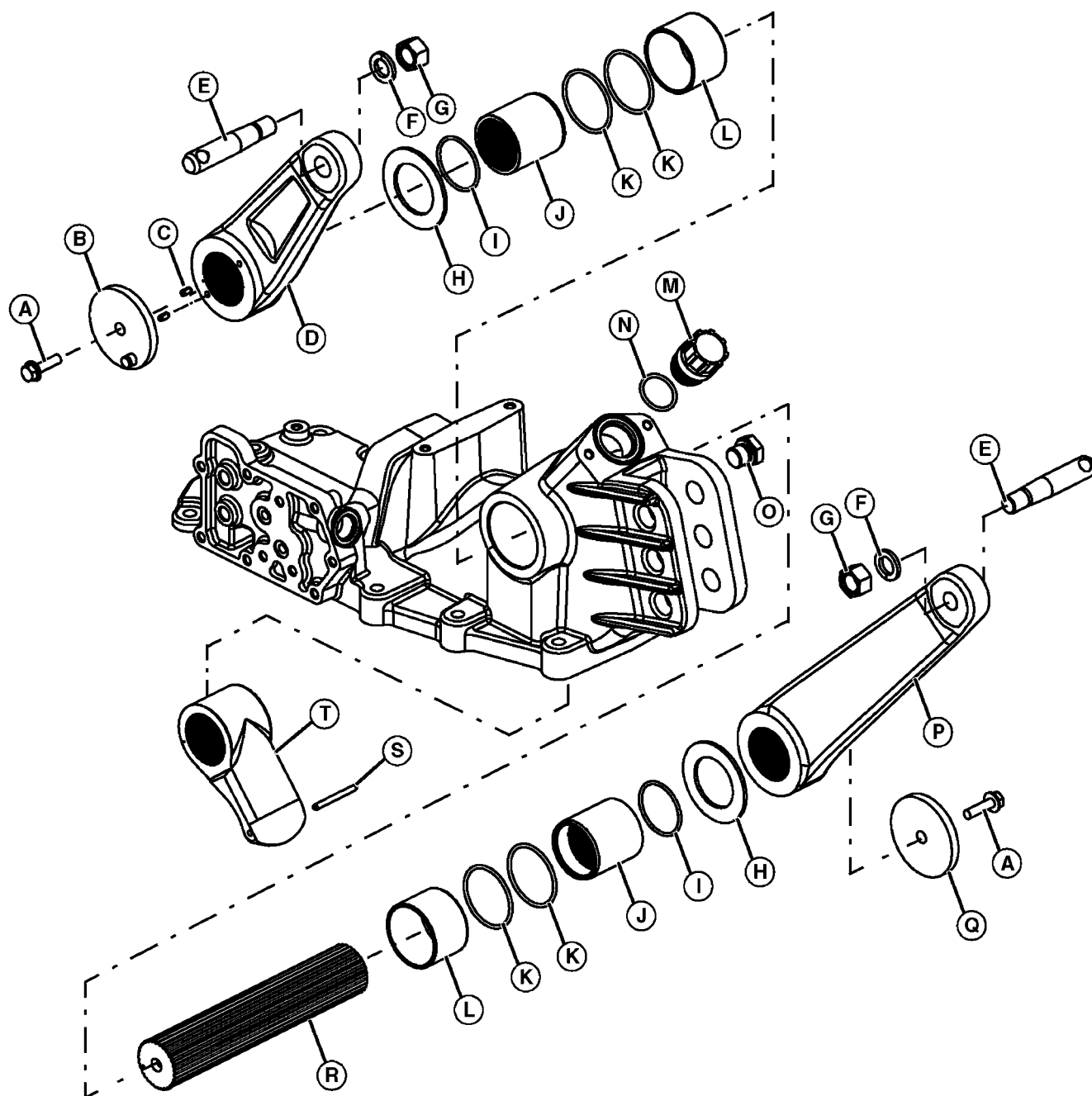
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Component Location

A—Nut	L—Cam	X—C-Clip (4 used)	AE—Bolt (2 used)
B—Washer	M—Key	Y—Link Bracket	AF—Bolt (5 used)
C—Arm, Lift Control	N—Washer	Z—Cam Shaft	AG—Snap Ring
D—Washer, Friction (AR)	O—Cotter Pin	AA—O-ring (2 used)	AH—Washer
E—Washer	P—O-ring	AB—Valve, Rockshaft Control	AI—Washer (2 used)
F—Tube	Q—Cam	AC—Socket Head Cap Screw (3 used)	AJ—Nut (2 used)
G—Flange Screw (2 used)	R—Pin	AD—Control Valve Cover	AK—Feedback Bracket
H—Bracket	S—Feedback Arm		
I—Bushing	T—O-ring (2 used)		
J—Bracket Weldment	U—Washer (2 used)		
K—Flange Screw (2 used)	V—Cam Shaft		
	W—C-Clip (4 used)		

SW03989,0000C98 -19-05NOV10-2/2

Rockshaft and Lift Arms (Exploded View)



A—Bolt (2 used)
 B—Plate, Cam
 C—Pin, Split (2 used)
 D—Arm, Lift
 E—Pin (2 used)

F—Lock Washer (2 used)
 G—Nut (2 used)
 H—Washer (2 used)
 I—O-ring (2 used)
 J—Splined Sleeve (2 used)

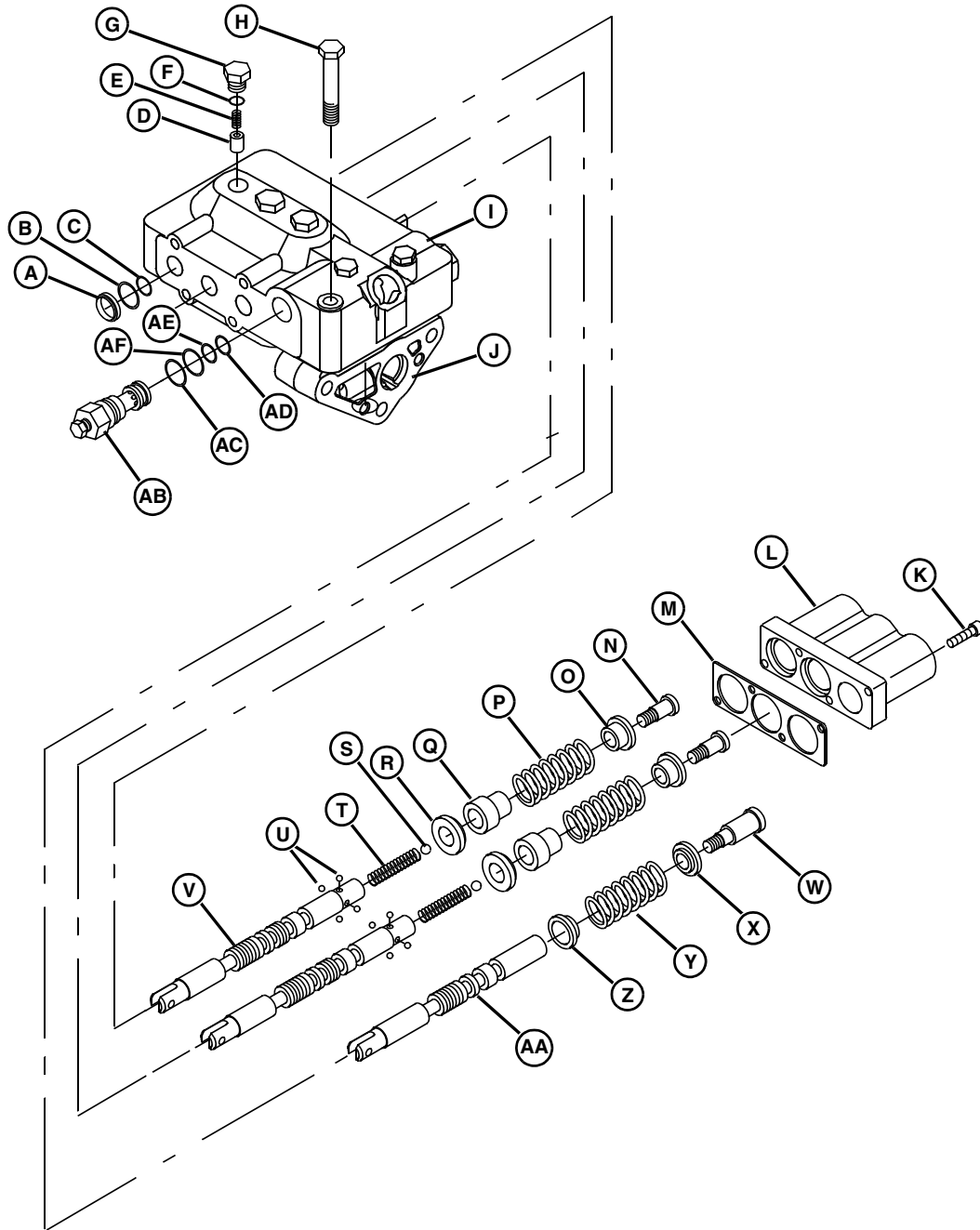
K—O-ring (4 used)
 L—Bushing (2 used)
 M—Cap
 N—O-ring
 O—Plug
 P—Arm, Lift
 Q—Plate

R—Shaft, Splined
 S—Pin
 T—Arm, Crank

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SCV Component Location



LVAL12467 —UN—12NOV10

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SW03989,0000C9A - 19-05NOV10-1/2

Component Location

A—Seal (3 used)	I— Valve Body	R—Spacer (2 used)	AA—Spool
B—Backing Washer (3 used)	J— Manifold	S—Ball (2 used)	AB—Valve, Relief
C—O-ring (3 used)	K—Cap Screw (2 used)	T—Spring (2 used)	AC—O-ring
D—Poppet (3 used)	L—Cover	U—Ball (4 used)	AD—O-ring
E—Spring (3 used)	M—Gasket	V—Spool (2 used)	AE—Backing Washer
F—O-ring (3 used)	N—Plug (2 used)	W—Plug	AF—Backing Washer
G—Cap (3 used)	O—Retainer, Spring (2 used)	X—Retainer, spring	
H—Cap Screw	P—Spring (2 used)	Y—Spring (2 used)	
	Q—Retainer, Spring (2 used)	Z—Retainer, Spring	

SW03989,0000C9A -19-05NOV10-2/2

The diagram illustrates the hydraulic system components for a Rockshaft System, including a SCV (Spool Control Valve) and a Rockshaft. The system is color-coded: Blue for Sump Oil (N), Red for High Pressure Oil (O), and Orange for Rockshaft Pressure Oil (P).

Legend:

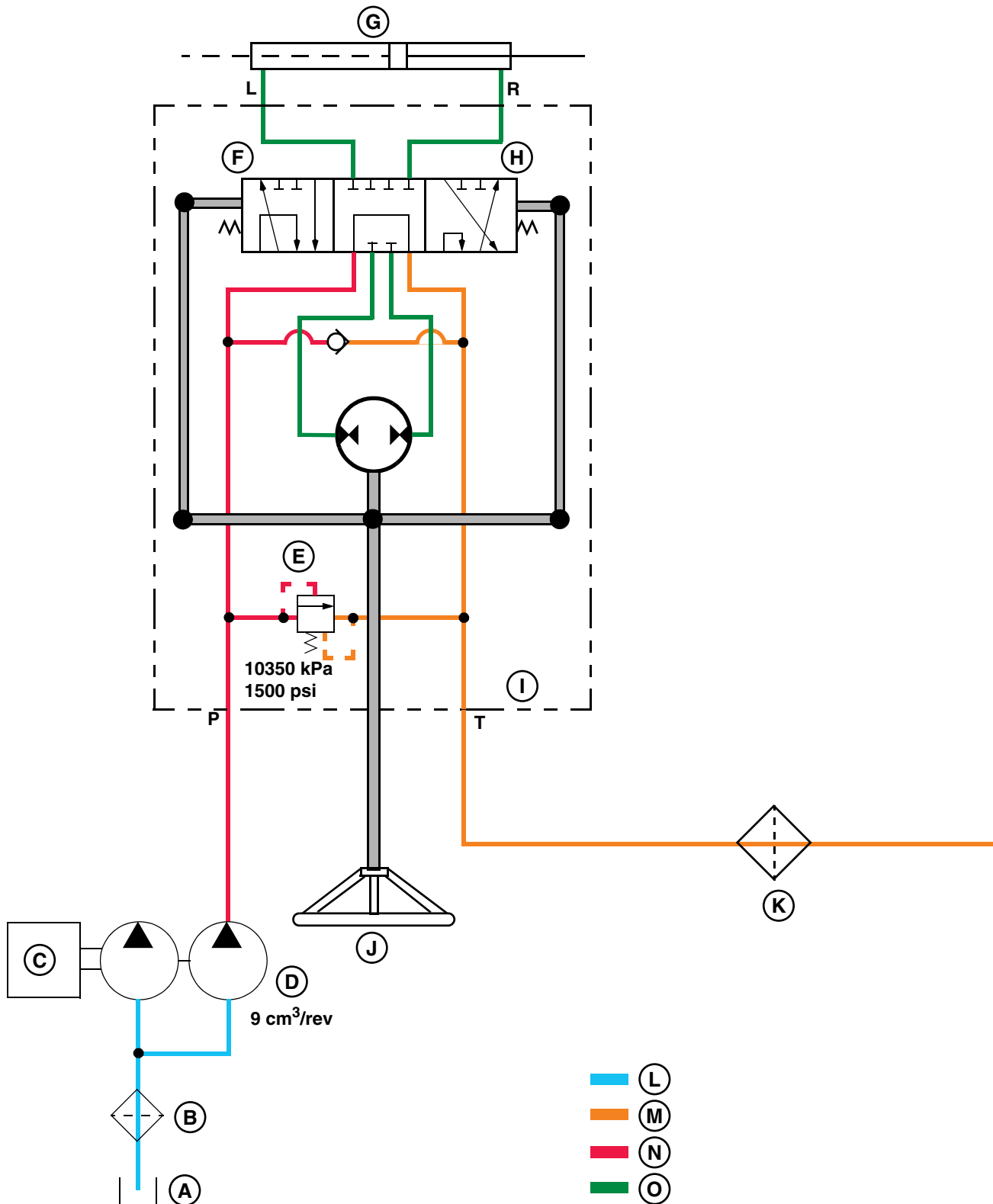
- N** (Blue): Sump Oil
- O** (Red): High Pressure Oil
- P** (Orange): Rockshaft Pressure Oil

Component Labels:

- A**—Gear Pump, Rear (Implement)
- B**—Hydraulic Oil Suction Manifold
- C**—SCV System Pressure Relief Valve
- D**—Rockshaft System Pressure Supply Line
- E**—Lowering Valve
- F**—Rate Of Drop/Stop Valve
- G**—Main Spool Valve
- H**—Piston Cover
- I**—SCV
- J**—Rockshaft Relief Valve
- K**—Rockshaft Control Arm
- L**—Position Feedback Linkage
- M**—Cylinder
- N**—Sump Oil
- O**—High Pressure Oil
- P**—Rockshaft Pressure Oil

TM2138 (23JAN13)

Steering System Schematics, PowrReverser™



LVAL12459 —UN—16NOV10

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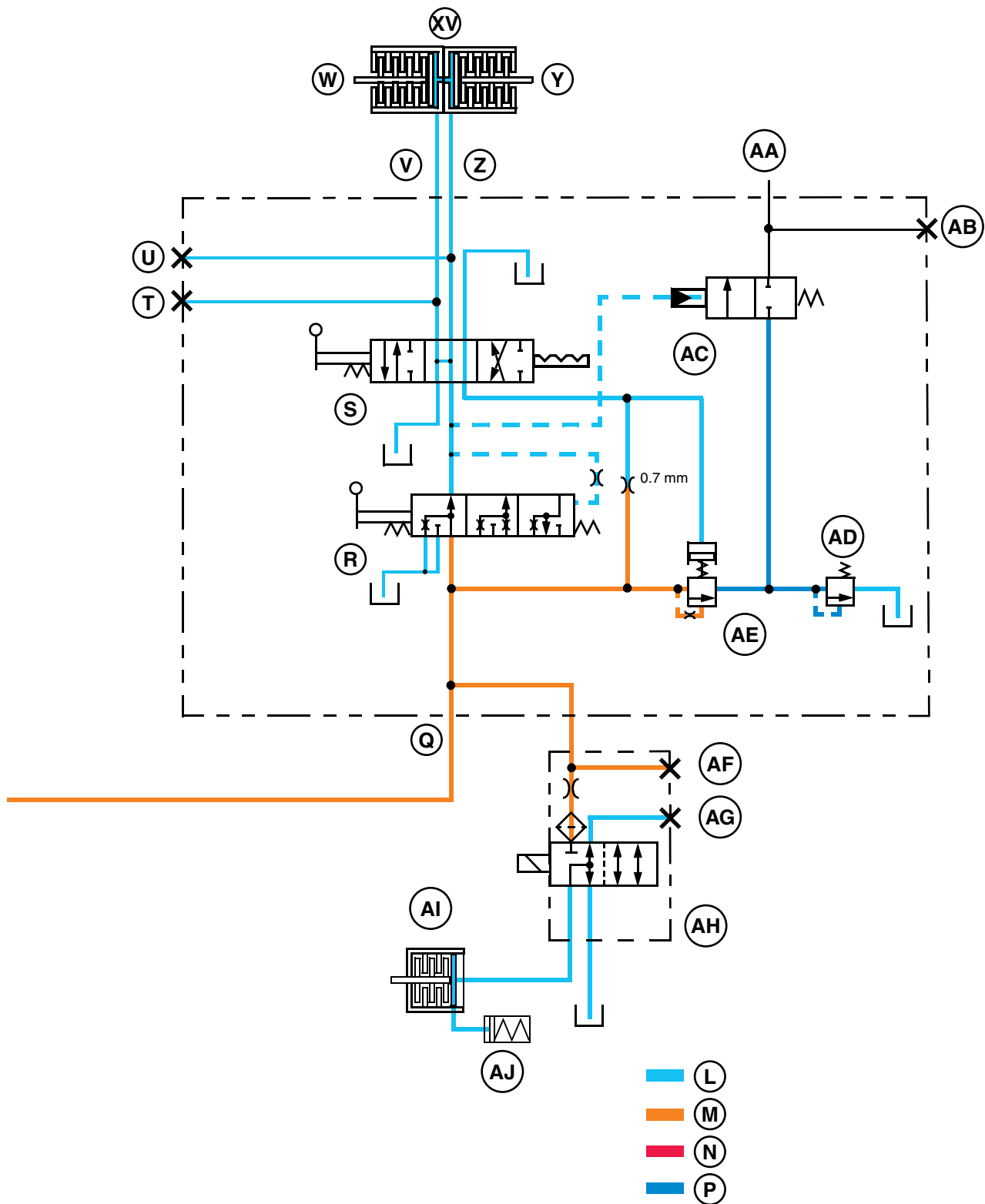
Schematics

- | | | | |
|------------------------|------------------------|--------------------------|---------------------|
| A—Sump | F—Left | K—In-Line Filter | N—High Pressure Oil |
| B—Suction Filter | G—Steering Cylinder | L—Sump Oil | O—Steering Oil |
| C—Engine | H—Right | M—Charge Pressure/Tunnel | |
| D—Steering Pump (Rear) | I—Power Steering Valve | Lubrication Oil | |
| E—Relief Valve | J—Steering Wheel | | |

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OUC1082,00030BE -19-22FEB12-2/4

Steering System Schematics, PowrReverser™ (continued)



LVAL12460 —UN—16NOV10

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OUO1082,00030BE -19-22FEB12-3/4

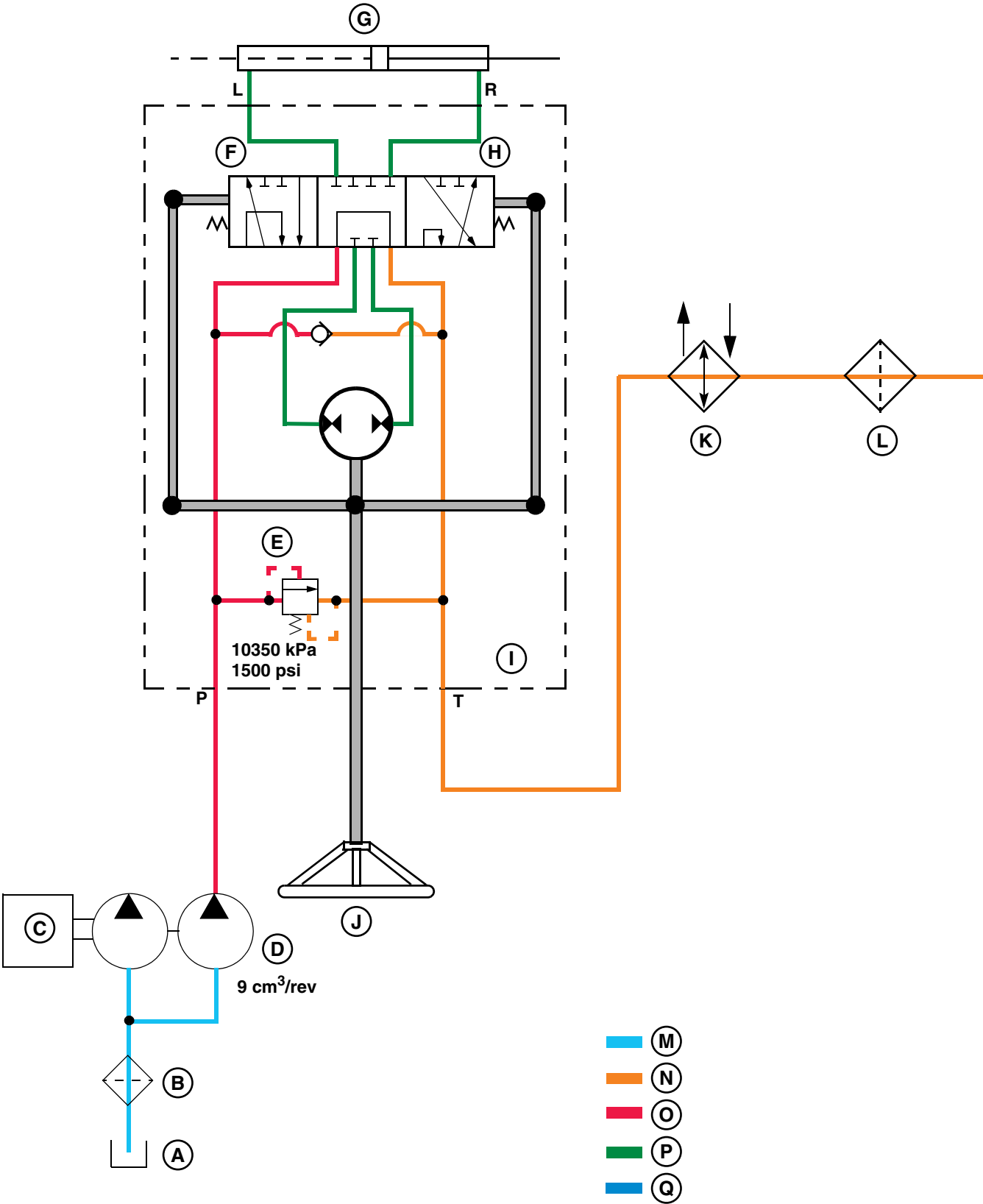
Schematics

L—Sump Oil	S—Forward/Reverse Valve (Neutral)	AA—Lubrication Oil Port	AG—Diverter Valve Port Return
M—Charge Pressure/Tunnel Lubrication Oil	T—Forward Test Port	AB—Lubrication Test Port	AH—PTO Clutch Solenoid Valve
N—High Pressure Oil	U—Reverse Test Port	AC—Lubrication Cut-Off Valve	AI— PTO Clutch
P—Lubrication Oil (Trapped)	V—Forward Port	AD—Lubrication Relief Valve	AJ—Accumulator
Q—Pressure in Port	W—Forward	AE—Modulation Valve	
R—Clutch Pedal Valve (Up)	X—Clutch	AF—Diverter Valve Port Out	
	Y—Reverse		
	Z—Reverse Port		

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OUO1082,00030BE -19-22FEB12-4/4

Steering System Schematics, eHydro™



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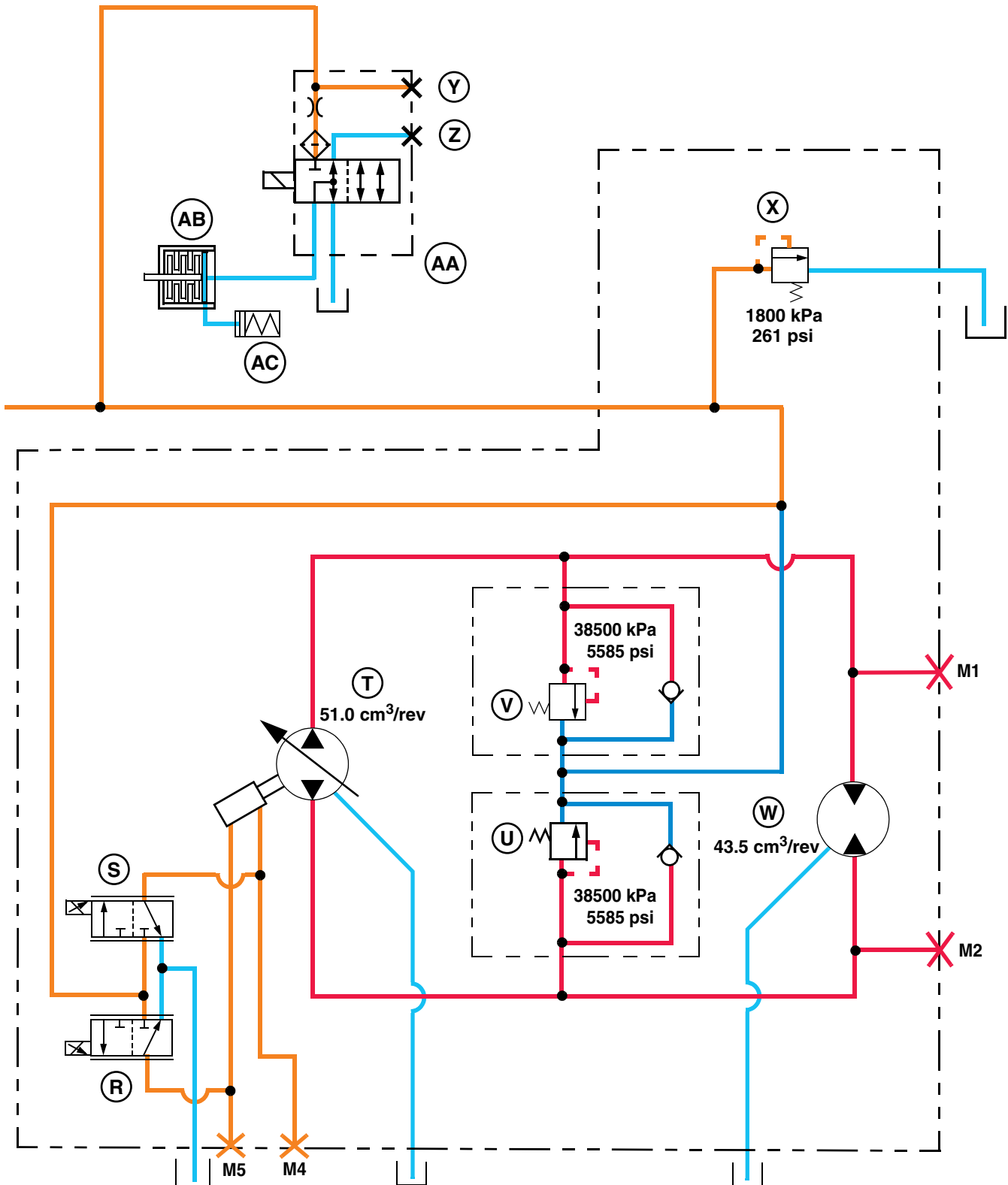
Schematics

A—Sump	G—Steering Cylinder	L—In-Line Filter	P—Steering Oil
B—Suction Filter	H—Right	M—Sump Oil	Q—Make-Up/Closed Loop Relief Oil
C—Engine	I— Power Steering Valve	N—Charge Pressure/Tunnel Lubrication Oil	
D—Steering Pump (Rear)	J— Steering Wheel	O—High Pressure Oil	
E—Relief Valve	K—Oil Cooler		
F—Left			

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OUC1082,00030BF -19-22FEB12-2/4

Steering System Schematics, eHydro™ (continued) (Hydrostatic Transmission)



LVAL12463—UN—16NOV10

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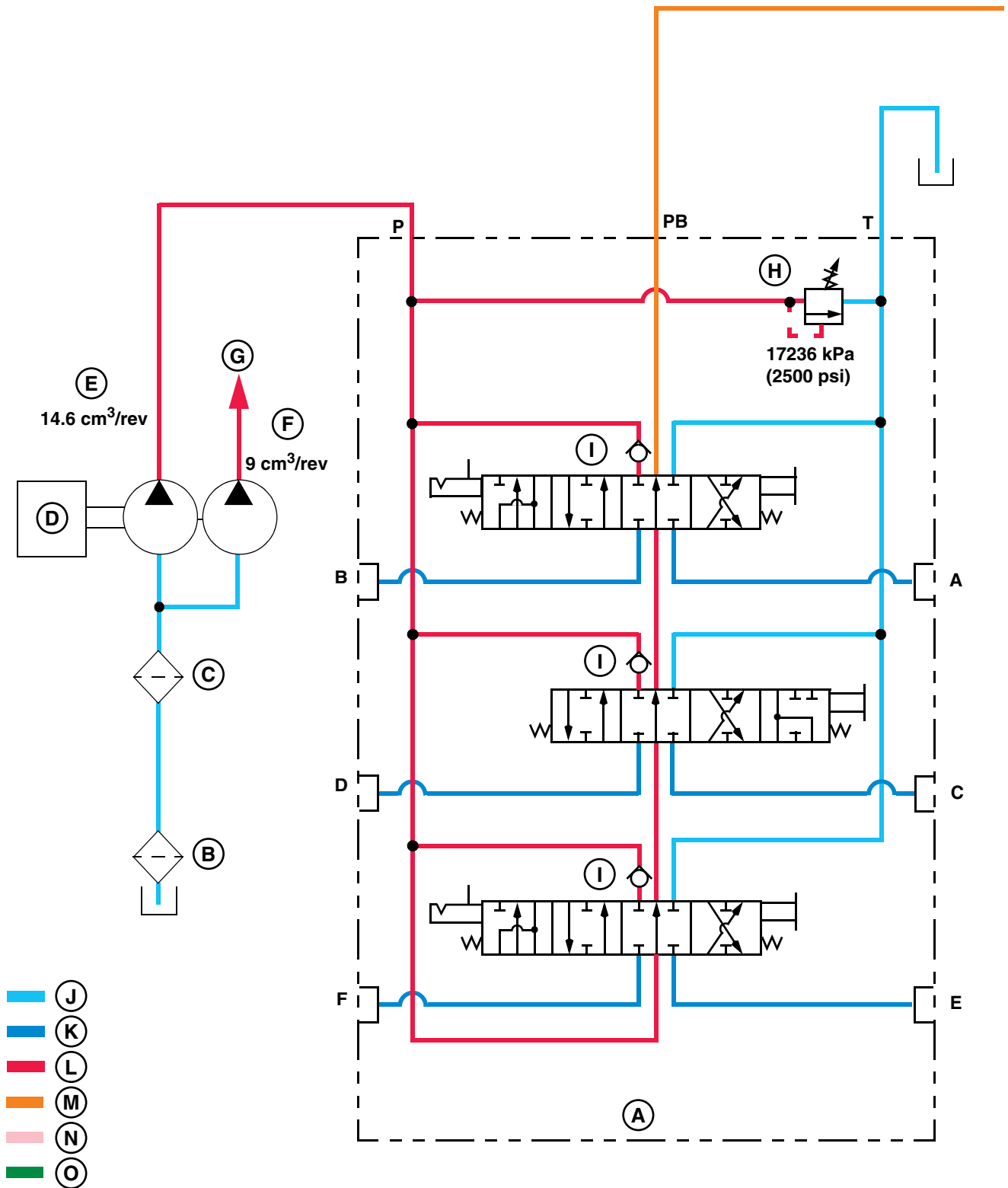
Schematics

R—Proportional Solenoid Valve	U—System Relief Valve	Y—Diverter valve Port Out	AB—PTO Clutch
S—Proportional Solenoid Valve	V—System Relief Valve	Z—Diverter Valve Port Return	AC—Accumulator
T—eHydro™ Hydraulic Pump	W—Hydraulic Motor	AA—PTO Clutch Solenoid Valve	
	X—Charge Pressure Relief Valve		

eHydro is a trademark of Deere & Company

OUC1082,00030BF -19-22FEB12-4/4

SCV and Rockshaft System Schematics (SN —710000)



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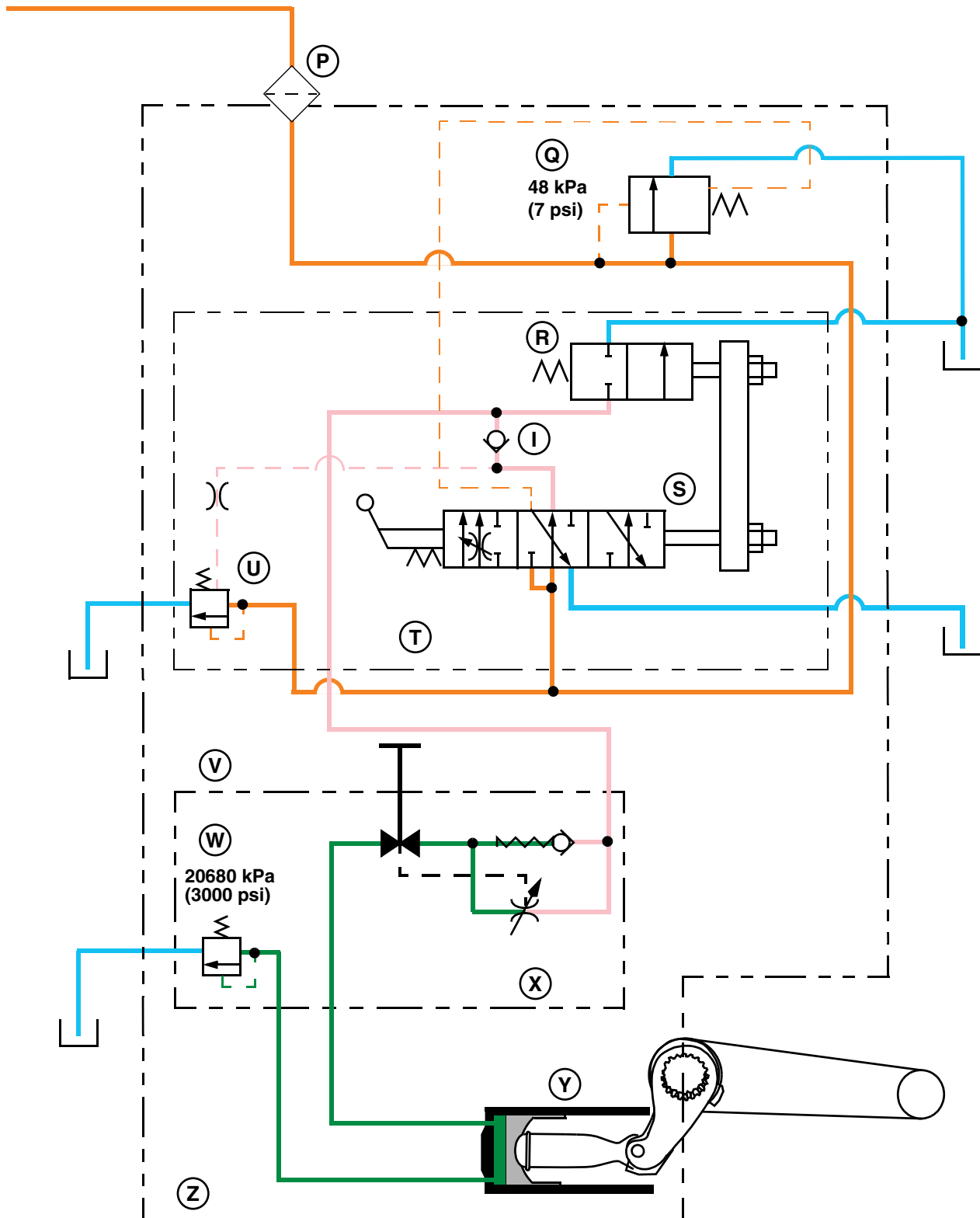
Schematics

- | | | | |
|---|--------------------------------|------------------------------|-------------------------------|
| A—3 Spool Selective Control Valve (SCV) | E—Implement Gear Pump (Front) | I— Load Check Valve (4 used) | N—Rockshaft Work Pressure Oil |
| B—Intake Filter (150 Mesh) | F—Steering Gear Pump (Rear) | J— Sump Oil | O— Rockshaft Cylinder Oil |
| C—Suction Filter | G—To Steering System | K—SCV Work Port Oil | |
| D—Engine | H—System Pressure Relief Valve | L— High Pressure Oil | |
| | | M—Rockshaft Pressure Oil | |

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OUO1082,00030C0 -19-01MAR12-2/4

SCV and Rockshaft System Schematics (SN —710000) (continued)



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OUO1082,00030C0 -19-01MAR12-3/4

Schematics

P—Filter Fitting
Q—Unload Valve
R—Lowering Valve
S—Main Spool Valve

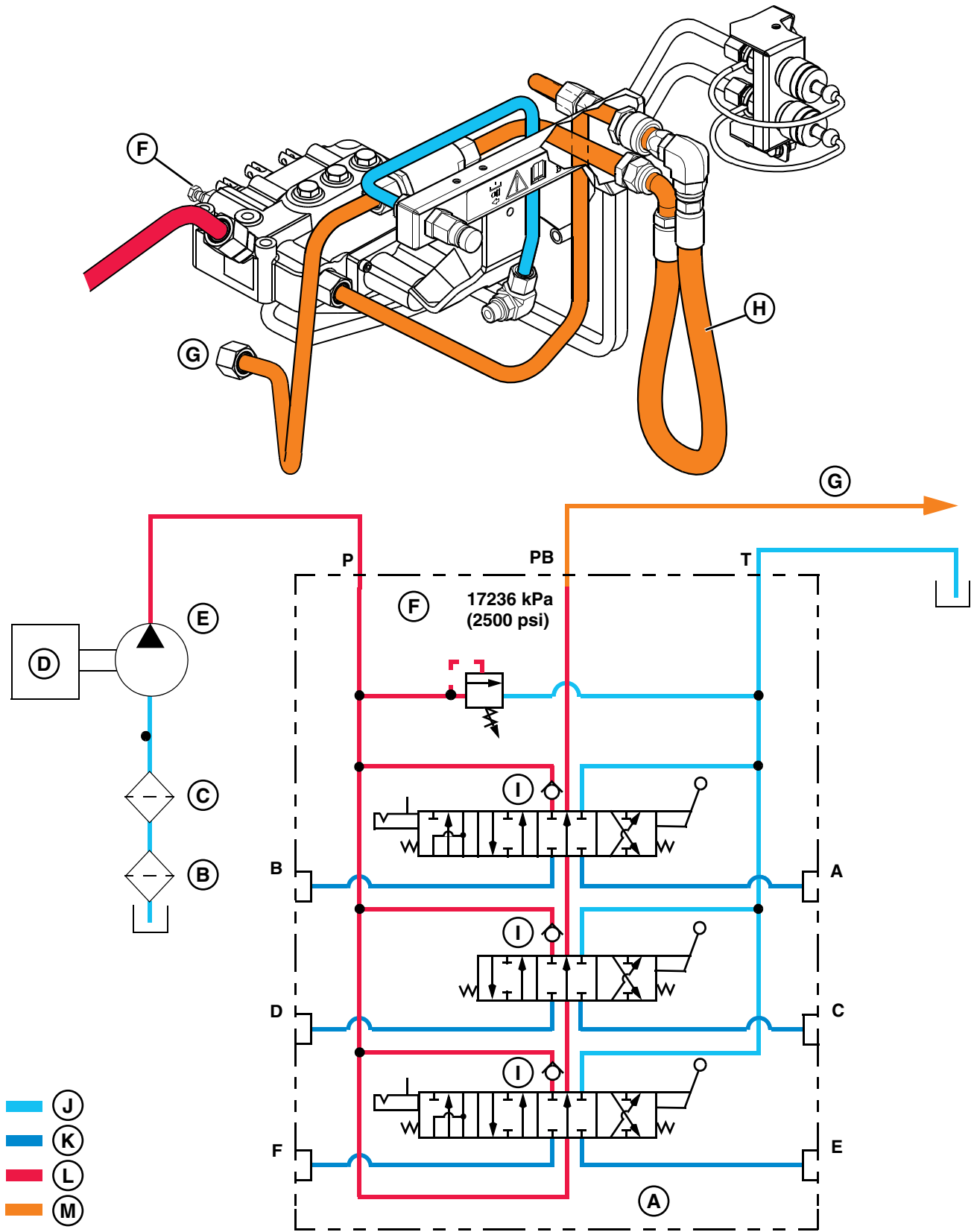
T—Rockshaft Control Valve
U—Flow Control Valve
V—Rate of Drop/Stop Valve

W—Rockshaft Relief Valve
X—Piston Cover
Y—Cylinder

Z— Rockshaft

OUC1082,00030C0 -19-01MAR12-4/4

Dual or Triple SCV Schematics (SN —710000)



LVAL12472 —UN—16NOV10

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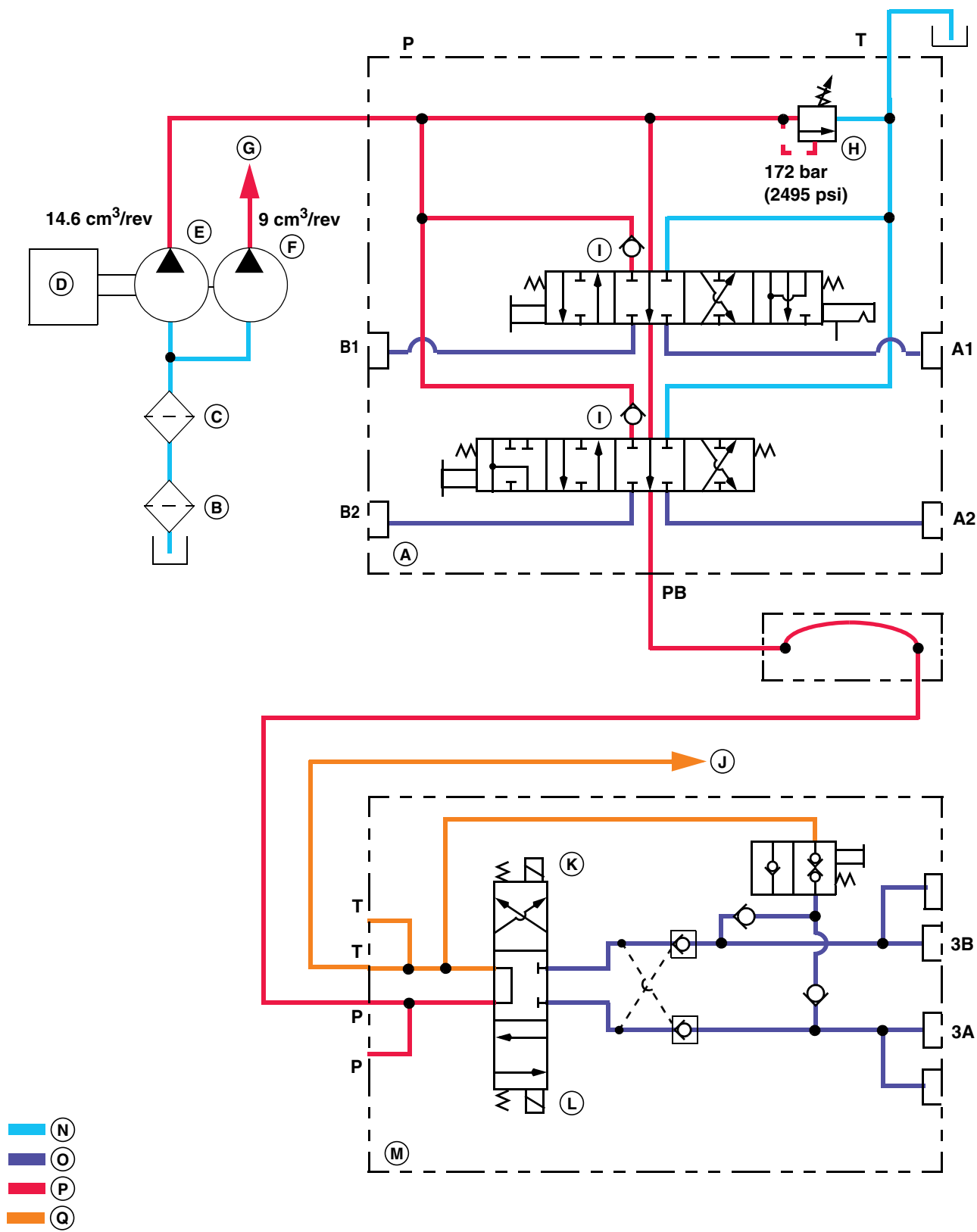
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Schematics

- | | | | |
|---|--------------------------------|---------------------|--------------------------|
| A—3 Spool Selective Control Valve (SCV) | D—Engine | H—Power Beyond Kit | L— High Pressure Oil |
| B—Intake Filter (150 mesh) | E—Gear Pump | I— Load Check Valve | M—Rockshaft Pressure Oil |
| C—Suction Filter | F—System Pressure Relief Valve | J— Sump Oil | |
| | G—To Power Beyond/Rockshaft | K—SCV Work Port Oil | |

OUC1082,00030B0 -19-01MAR12-2/2

2-Spool SCV Schematics (SN 710001—)



LV15491 —UN—23FEB12

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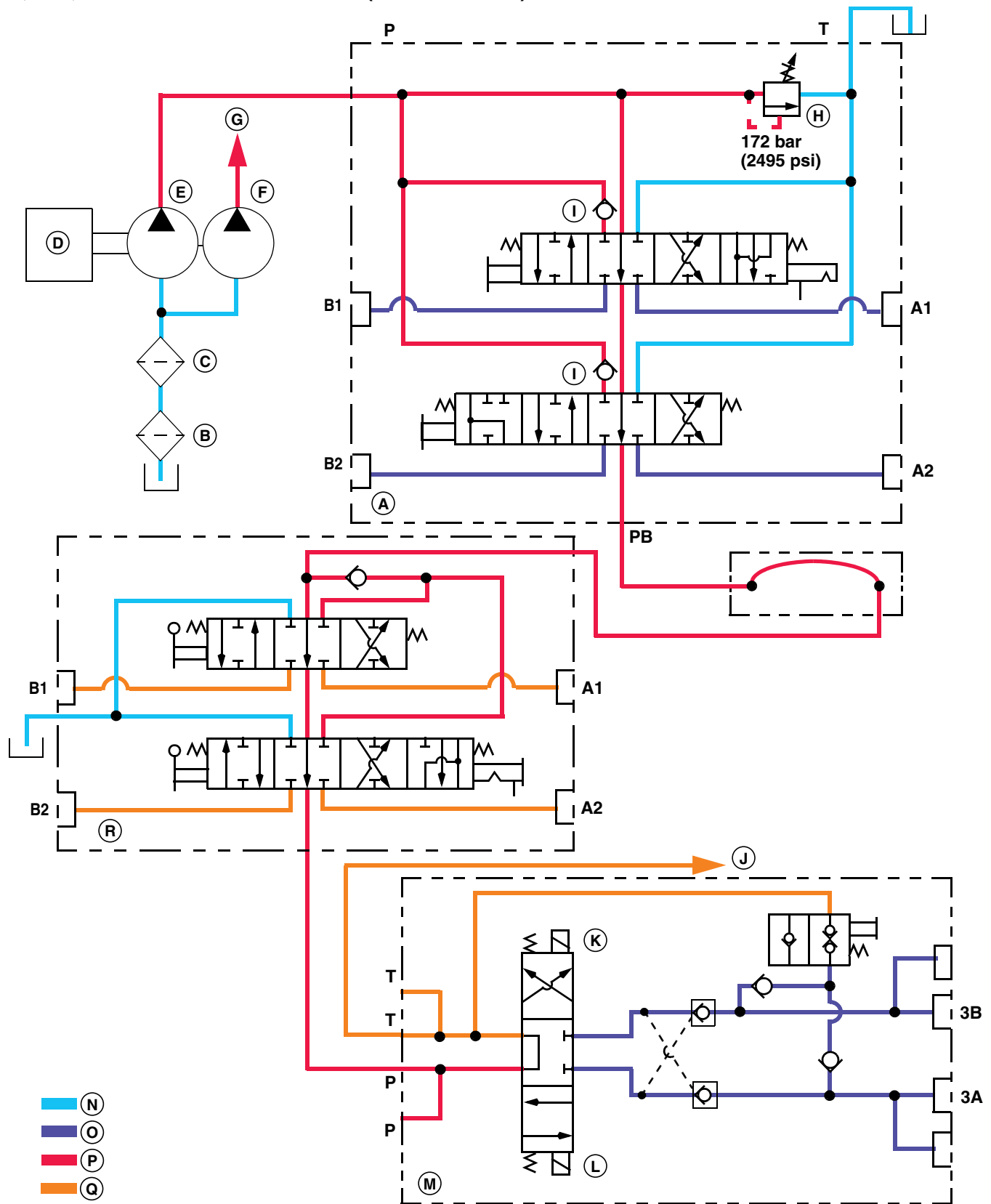
OUC1082,00030B1 -19-02MAR12-1/2

Schematics

A—2 Spool Selective Control Valve (SCV)	F—Gear Pump	L—Y10 Third Function “B” Solenoid	Q—Rockshaft Pressure Oil
B—Intake Filter (150 mesh)	G—To Steering	M—Electro-Hydraulic 3rd SCV	
C—Suction Filter	H—System Pressure Relief Valve	N—Sump Oil	
D—Engine	I— Load Check Valve	O—SCV Work Port Oil	
E—Implement Gear Pump	J— To Rockshaft	P—High Pressure Oil	
	K—Y09 Third Function “A” Solenoid		

OJO1082,00030B1 -19-02MAR12-2/2

3rd, 4th, and 5th SCV Schematics (SN 710001—)



LV15492-UN-23FEB12

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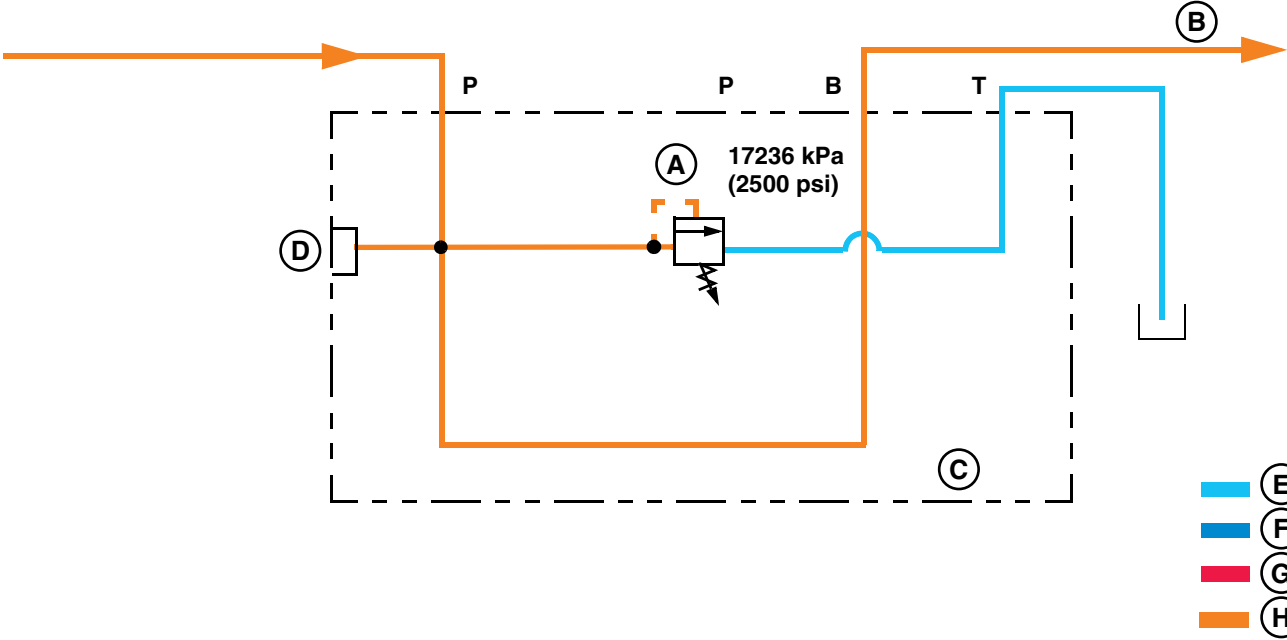
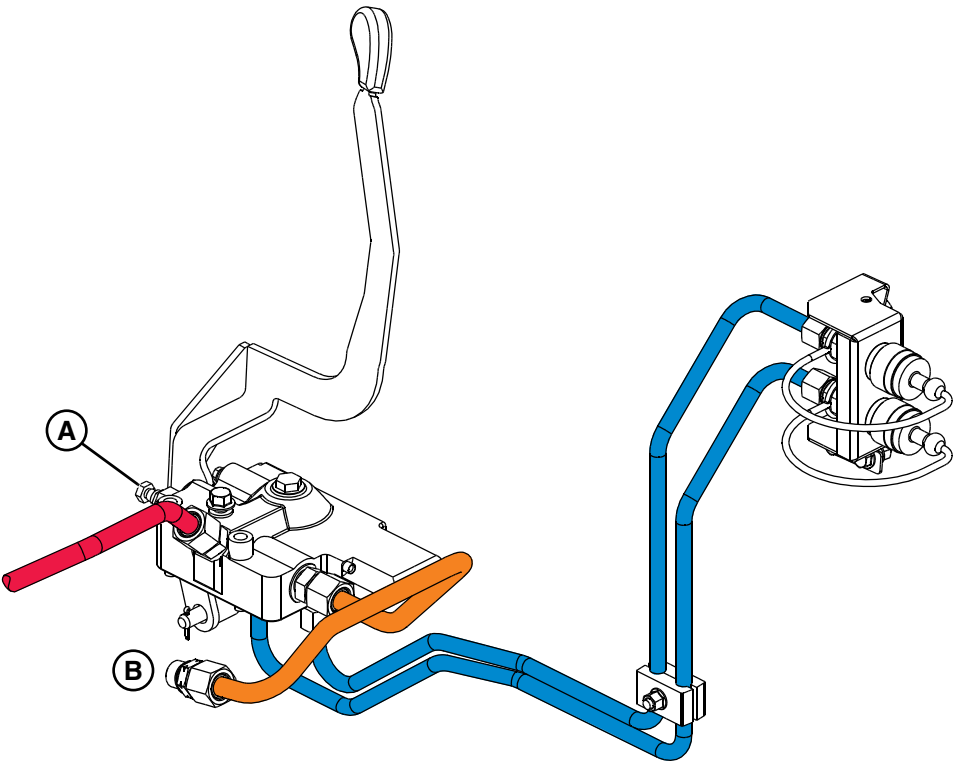
OUO1082,00030B2 -19-02MAR12-1/2

Schematics

A—2 Spool Selective Control Valve (SCV)	F—Steering Gear Pump	L—Y10 Third Function “B” Solenoid	Q—Rockshaft Pressure Oil
B—Intake Filter (150 mesh)	G—To Steering	M—Electro-Hydraulic 3rd SCV	R—4th and 5th SCV
C—Suction Filter	H—System Pressure Relief Valve	N—Sump Oil	
D—Engine	I— Load Check Valve	O—SCV Work Port Oil	
E—Implement Gear Pump	J— To Rockshaft	P—High Pressure Oil	
	K—Y09 Third Function “A” Solenoid		

OUO1082,00030B2 -19-02MAR12-2/2

Manifold Block Schematics



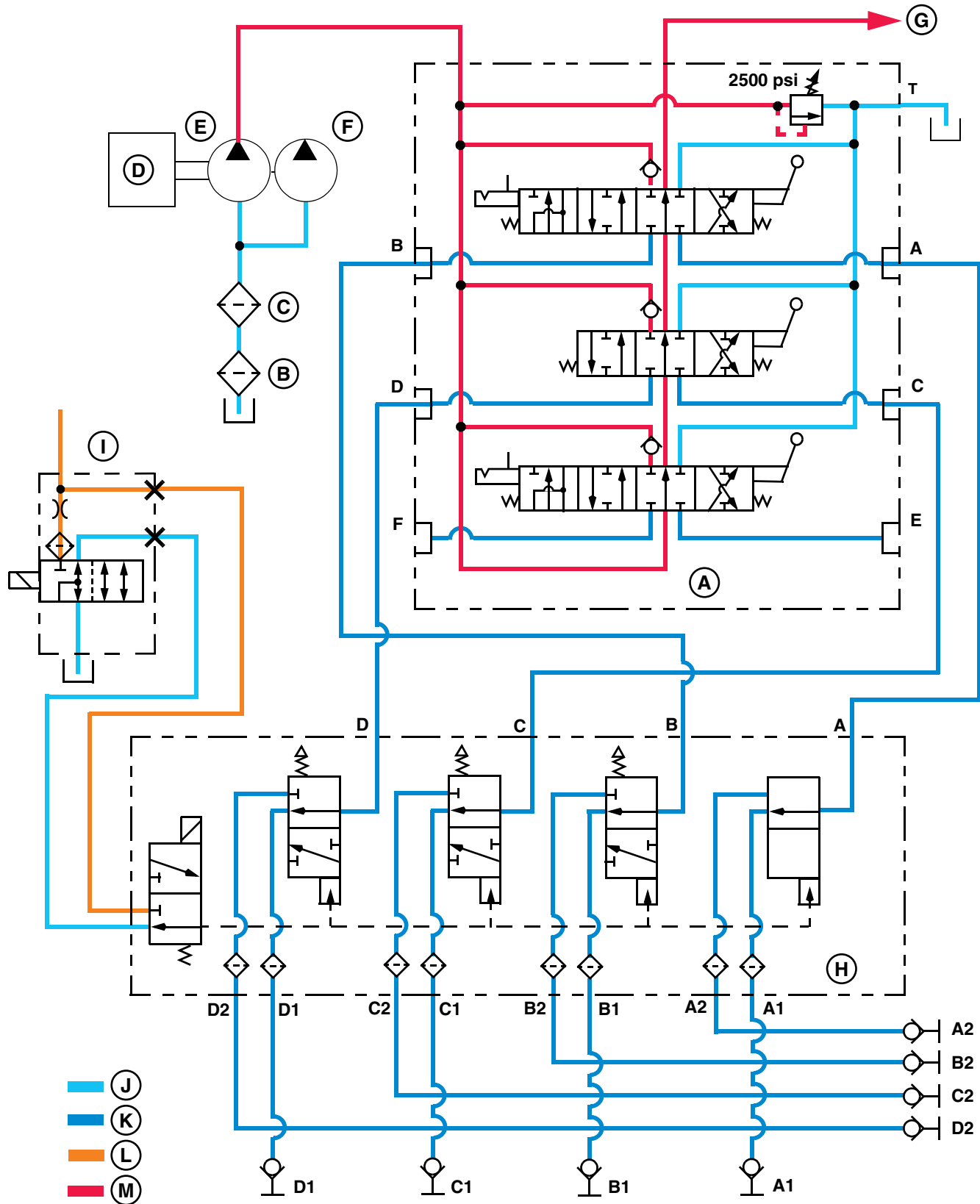
LVAL12471 —UN—16NOV10

Schematics

A—System Pressure Relief Valve	E—Sump Oil	I— Load Check Valve (3 used)	M—Rockshaft Pressure Oil
B—To Rockshaft	F—SCV Work Port Oil	J— Sump Oil	
C—Manifold Block	G—High Pressure Oil	K—SCV Work Port Oil	
D—Test Port	H—Rockshaft Pressure Oil	L— High Pressure Oil	

OUO1082,00030BB -19-22FEB12-2/2

Diverter Valve Schematic (SN —710000)



LVAL12473 —UN—16NOV10

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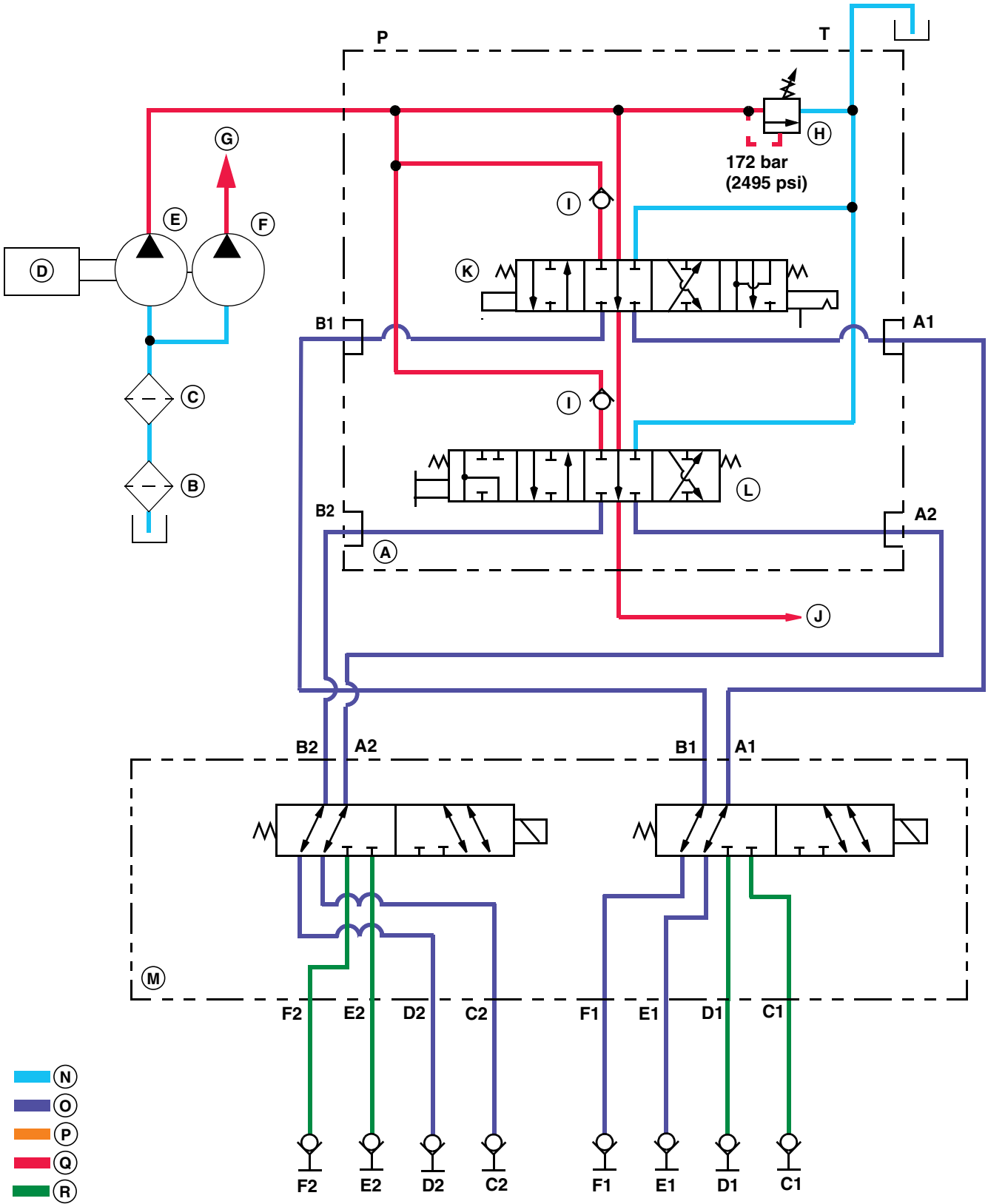
OUO1082,00030C1 -19-01MAR12-1/2

Schematics

- | | | | |
|---|-------------------------------|------------------------------|---|
| A—3 Spool Selective Control Valve (SCV) | D—Engine | H—Diverter Valve | L— Charge Pressure Oil (PTO Solenoid Valve) |
| B—Intake Filter (150 mesh) | E—Implement Gear Pump (front) | I— PTO Clutch Solenoid Valve | M—High Pressure Oil |
| C—Suction Filter | F—Steering Gear Pump (rear) | J— Sump Oil | |
| | G—To Rockshaft | K—SCV Work Port Oil | |

OUO1082,00030C1 -19-01MAR12-2/2

Diverter Valve Schematic (SN 710001—)



LV15493 —UN—23FEB12

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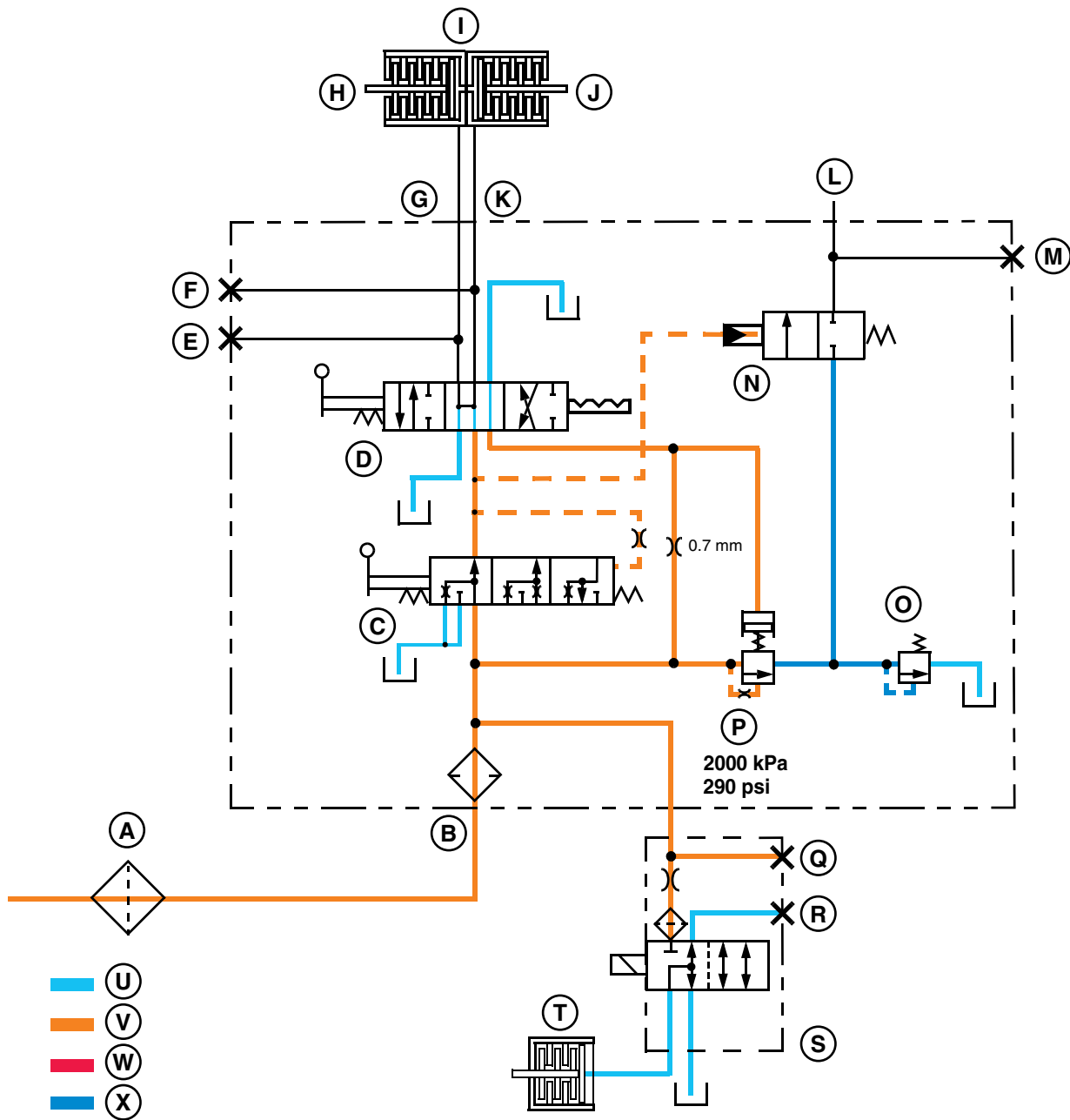
OOU1082,00030B3 -19-02MAR12-1/2

Schematics

- | | | | |
|---|--------------------------------|---------------------|------------------------|
| A—2 Spool Selective Control Valve (SCV) | E—Implement Gear Pump | I— Load Check Valve | O—SCV Work Port Oil |
| B—Intake Filter (150 mesh) | F—Steering Gear Pump | J— To Rockshaft | P— Charge Pressure Oil |
| C—Suction Filter | G—To Steering | K—Spool 1 | Q—High Pressure Oil |
| D—Engine | H—System Pressure Relief Valve | L— Spool 2 | R—Trapped Oil |
| | | M—Diverter Valve | |
| | | N—Sump Oil | |

OUC1082,00030B3 -19-02MAR12-2/2

PowrReverser™ Hydraulic Operation



A—In-Line Filter
B—Pressure In Port
C—Clutch Pedal Valve (Up)
D—Forward/Reverse Valve (Neutral)
E—Forward Test Port
F—Reverse Test Port

G—Forward Port
H—Forward Port
I—Clutch
J—Reverse
K—Reverse Port
L—Lubrication Oil Port
M—Lubrication Test Port
N—Lubrication Cut-Off Valve

O—Lubrication Relief Valve
P—Modulation Valve
Q—Diverter Valve Port Out
R—Diverter Valve Port Return
S—PTO Clutch Solenoid Valve
T—PTO Clutch

U—Sump Oil
V—Charge Pressure/Tunnel Lubrication Oil
W—High Pressure Oil
X—Lubrication Oil (Trapped)

Theory

The PowrReverser™™ hydraulic system receives its supply from the power steering return line. The oil is run through an in-line filter.

Continued on next page

OUC1082,00030C2 -19-22FEB12-1/2

The filtered oil then is regulated to a pressure of **2000 kPa (290 psi)** for the traction clutches and hydraulic system. The flow that goes through the modulation valve then is used for lubrication. The lube circuit also has a relief valve. If the lube pressure rises too high the valve opens and allows the pressure to be relieved.

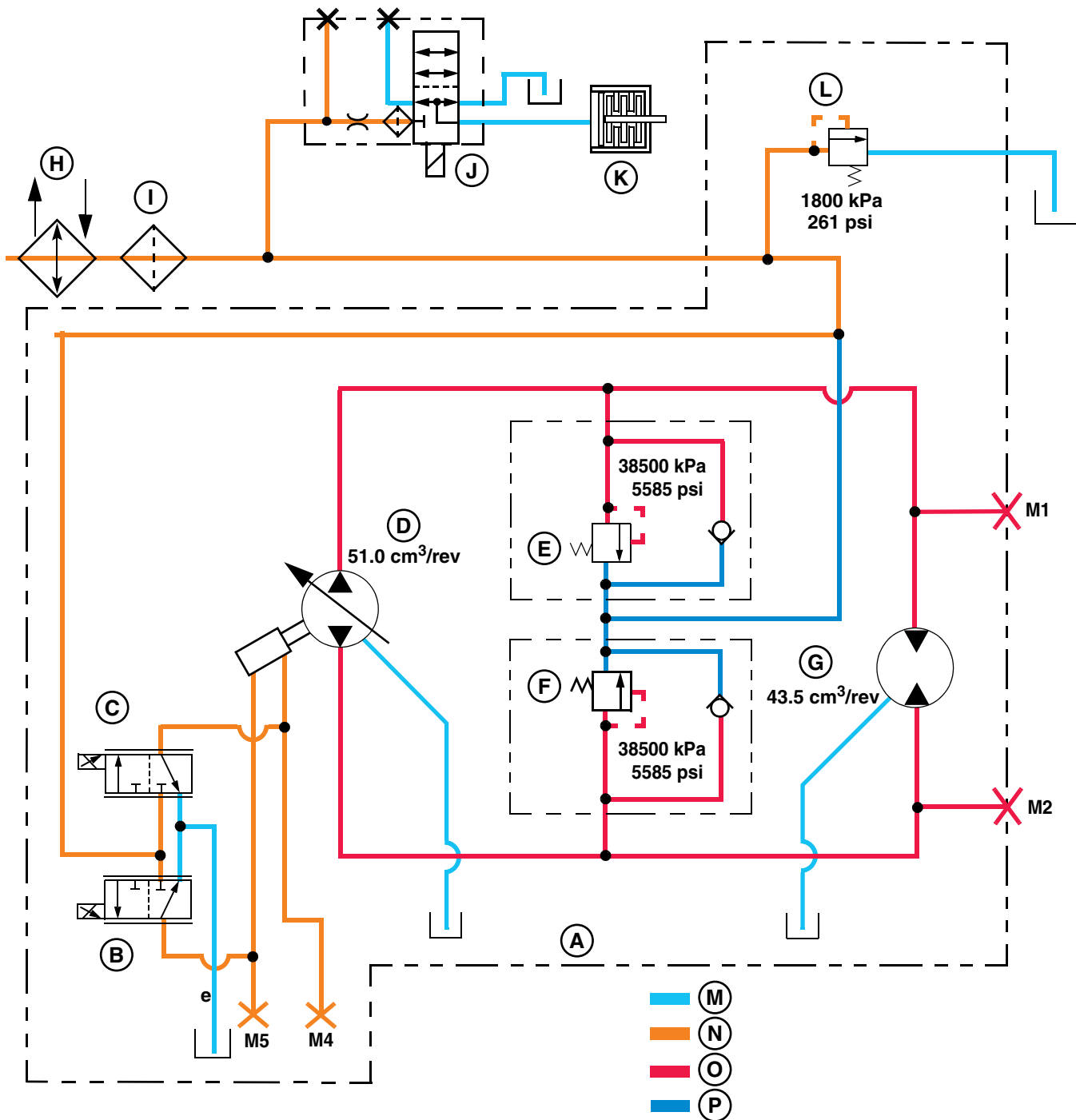
The oil that is regulated to **2000 kPa (290 psi)** travels through the clutch pedal valve to the forward/reverse

valve to the traction clutches. The forward/reverse valve spool controls the oil going to the traction clutches. When the direction is selected, the pressure oil is supplied to one side of the clutch and the oil in the other side of the clutch is released to the sump.

PowrReverser is a trademark of Deere & Company

OUO1082,00030C2 -19-22FEB12-2/2

eHydro™ Hydraulic Operation



A—Hydrostatic Transmission
 B—Proportional Solenoid Valve
 C—Proportional Solenoid Valve
 D—eHydro™ Hydraulic Pump

E—System Relief Valve
 F—System Relief Valve
 G—Hydraulic Motor
 H—Oil Cooler
 I—In-Line Filter
 J—PTO Clutch Solenoid Valve

K—Main PTO Clutch
 L—Charge Pressure Relief Valve
 M—Sump Oil
 N—Charge Pressure/Tunnel Lubrication Oil
 O—High Pressure Oil

P—Make-Up/Closed Loop Relief Oil

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OUO1082,00030C3 -19-22FEB12-1/2

LVAL12475—UN—16NOV10

Theory

The eHydro™ hydraulic system receives its supply from the power steering return line. This oil is pumped through an oil cooling radiator in front of the main radiator.

The charge pressure oil then passes through an in-line filter. The filtered oil goes to the PTO clutch solenoid and the hydrostatic transmission.

The charge pressure oil is regulated to **1800 kPa (261 psi)** and travels to the transmission proportional solenoid valves and the hydraulic pump and motor make-up oil line.

The proportional valves, one for forward and one for reverse, control the oil going to the servo control of the hydraulic pump. The proportional valves are controlled by the electronic logic controller. See controller theory in the Electrical section.

The hydraulic pump is connected directly to the engine and is rotating any time the engine is running. The swash plate of the hydraulic pump is servo controlled and remains flat unless one of the proportional valves opens and the servo rotates the plate. When the swash plate rotates, oil is pumped through the transmission to

rotate the hydraulic motor. Oil is pumped either direction through the transmission depending on which direction the hydraulic pump swash plate is rotated. The direction of the oil flow controls the direction of motor rotation.

Only the side of the pump and motor circuit loop that the pump is sending oil into has high pressure. The other side of the circuit loop provides a return route for the hydraulic motor oil and supply oil for the hydraulic pump. If the low-pressure side falls below **1800 kPa (261 psi)** the check valve opens and charge pressure oil enters the circuit to make-up any lost oil.

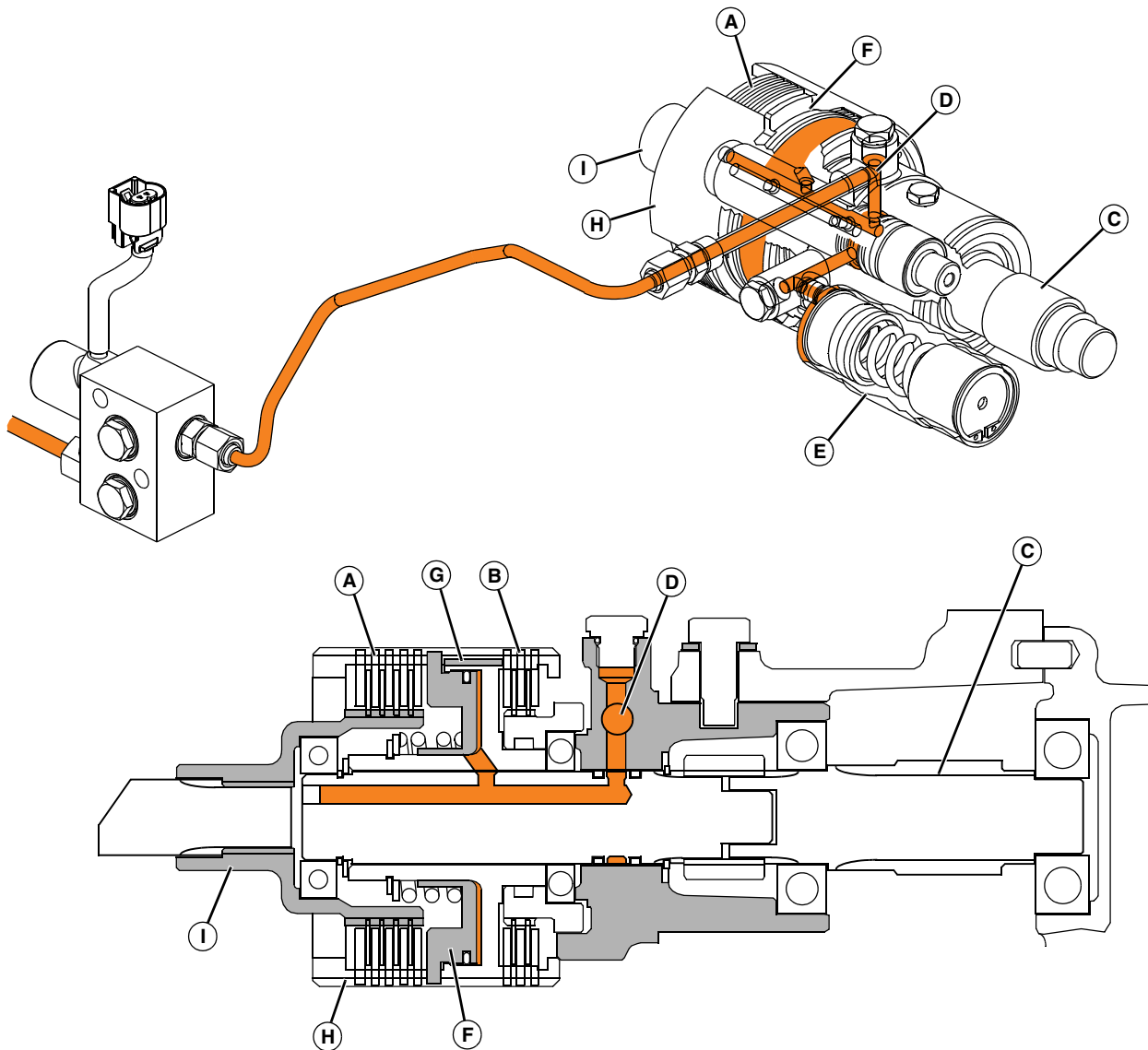
The system relief valves open if the hydraulic pump pressure exceeds **38500 kPa (5585 psi)** on the motor drive side of the circuit.

The M1 and M2 pressure ports provide locations that may be used for checking the charge pressure of **1800 kPa (261 psi)** and the motor drive pressure of **38500 kPa (5585 psi)**. The higher drive pressure and lower charge pressure will be at the opposite ports when the machine is in reverse as compared to the pressures when the machine is in forward.

eHydro is a trademark of Deere & Company

OUO1082,00030C3 -19-22FEB12-2/2

Main PTO Clutch Operation



A—Clutch
B—Brake
C—Clutch Shaft

D—Side Port
E—Spring Loaded Accumulator

F—Piston
G—Pin (3 used)
H—Clutch Basket

I—Clutch Hub

Function:

The PTO clutch provides a means for disengaging the PTO output shaft from the engine. The PTO brake is provided to positively stop the rotation of the PTO system when the PTO clutch is disengaged. The PTO clutch and PTO brake work simultaneously. Both the mid and rear

PTO are affected by the operation of the PTO clutch and PTO brake.

The rear PTO shaft is engaged directly from the clutch. The mid PTO gears are driven by gears engaged to the rear PTO. The mid PTO gears are only engaged when they are shifted into gear.

LVAL12476—UN—12NOV10

Continued on next page

OOU01082,00030C4 -19-22FEB12-1/2

Theory:

The PTO clutch (A) is engaged or disengaged by the operator through an electrical switch which controls the solenoid of the PTO valve (See "PTO Valve Operation" below). The PTO brake (B) is automatically spring applied when the PTO clutch is disengaged. The PTO brake is a spring loaded multi-plate wet brake and is normally engaged, preventing the PTO clutch shaft (C) from rotating. The PTO clutch is a multi-plate wet clutch and is normally disengaged.

When the operator pulls the PTO switch to the on position, a hydraulic control valve is activated and supplies pressurized hydraulic oil to activate the PTO clutch through a side port (D). The pressurized oil is kept from engaging the clutch too abruptly when a PTO attachment

is being used, by a spring loaded accumulator (E) to the side of the clutch.

The PTO clutch piston is moved forward by the hydraulic pressure. As the piston (F) moves forward, the spring pressure applied to the brake by the piston, through the three pins (G), is removed and disengages the brake. At the same time, the piston is applying pressure to the PTO clutch pack and engaging the PTO clutch. The pressure applied to the clutch pack locks the plates (splined to the clutch basket (H)), to the friction plates (locked to the clutch hub (I)). Power is transferred from the input shaft to the clutch hub, through the friction plates and separator plates to the clutch basket, and finally to the PTO drive shaft.

A locking tab on the outside of the brake housing allows the PTO drive shaft to rotate slightly to aid in aligning the splines of an attachment drive shaft during hookup.

OUO1082,00030C4 -19-22FEB12-2/2

PTO Valve Operation

Function:

The PTO control valve is an electrically operated single spool hydraulic valve. The valve controls the PTO clutch by supplying pressurized oil to the clutch when the solenoid is activated.

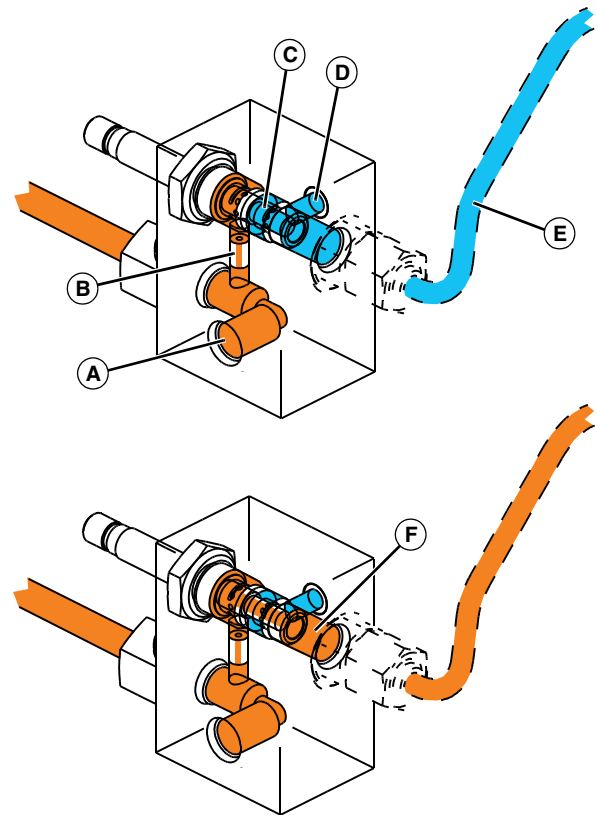
The PTO control valve is also the connection point for hydraulic control oil to the diverter valve kit option.

Theory:

In the normally off state, pressurized oil is provided to the solenoid valve body lower chamber (A). An orifice (B) provides a narrow route for the pressurized oil to the solenoid valve stem where it is trapped unless the valve coil is energized.

A port (D) is the valve block is vented directly to the transmission sump. Holes in the stem core align with slots in the valve stem and oil from the PTO clutch (E) flows through the valve stem to the sump which keeps the PTO clutch disengaged.

When the PTO valve solenoid is energized, the solenoid valve stem core (C) is pulled toward the solenoid coil. The holes in the valve stem core, which had been aligned with the slots in the valve stem, are blocked and the PTO clutch is no longer vented to the transmission sump. A second set of holes in the stem core align with slots in the valve stem and the pressurized oil flows through the valve stem (F) core to the PTO clutch.

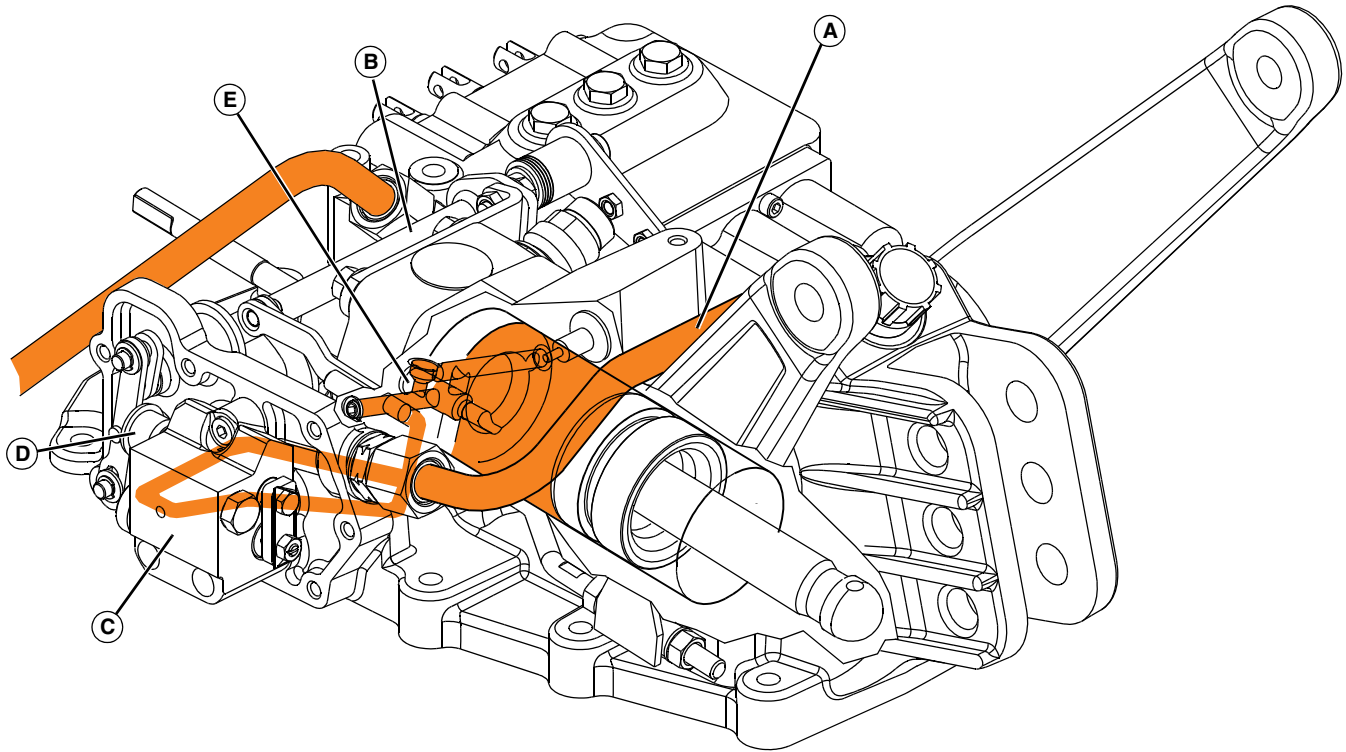


- | | |
|-------------------------------------|--------------|
| A—Solenoid Valve Body Lower Chamber | D—Port |
| B—Orifice | E—Clutch |
| C—Solenoid Valve Stem Core | F—Valve Stem |

LVAL12477 —UN—12NOV10

OUO1082,00030C5 -19-22FEB12-1/1

Rockshaft Operation



A—SCV Valve Block
B—Cross-Shaft

C—Rockshaft Control Valve
D—Main Spool

E—Drop/Stop Valve
F—Piston Cover

Charge pressure oil is provided to the rockshaft control valve from the SCV valve block (A).

The rockshaft is operated by moving the lift control lever. The lever rotates a cross-shaft (B) that is linked to the rockshaft control valve (C).

The control valve contains two spools, the main spool (D) for raising and lowering the rockshaft and one for rockshaft position sensing. When the cross-shaft is rotated, the

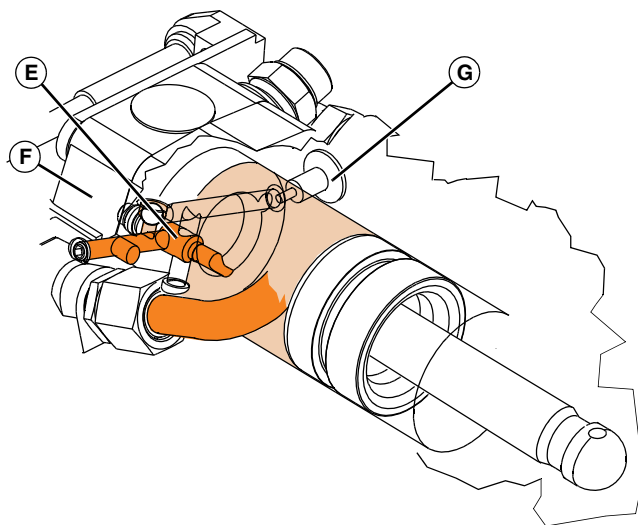
control linkage pushes in the main spool or allows the main spool spring to back the spool out of the control valve. When the spool is pushed in, charge oil is allowed to enter the piston cylinder and the rockshaft arms raise.

The rate of drop/stop valve (E) controls the rate at which oil enters and leaves the cylinder. Turning the control knob under the front of the operators seat changes the rate of drop/stop valve setting from fully open to fully closed.

Continued on next page

OOU1082,00030C6 -19-22FEB12-1/4

LVAL12478 —UN—12NOV10



E—Drop/Stop Valve

F—Piston Cover

G—Port

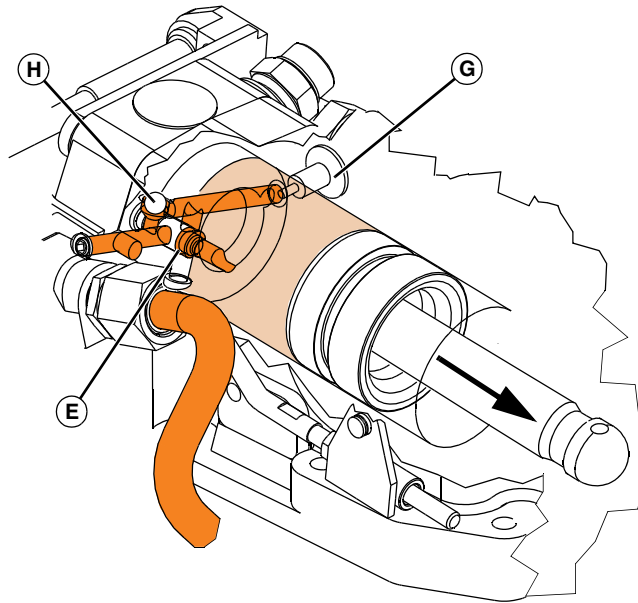
With the rate of drop/stop valve (E) fully open, Charge oil, controlled by the control valve, passes through a passage into the piston cover (F), past the rate of drop/stop valve and into the cylinder.

Cylinder pressure can be measured at port (G).

Continued on next page

OUO1082,00030C6 -19-22FEB12-2/4

LVAL12479 —UN—12NOV10



E—Drop/Stop Valve

G—Port
H—Check Ball

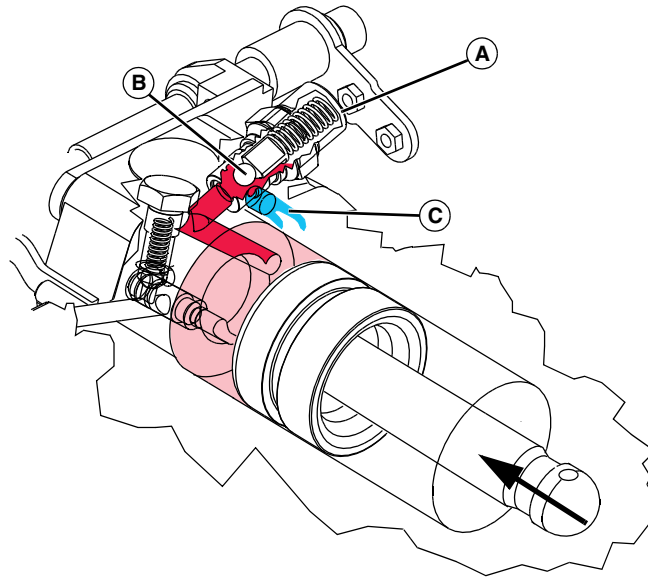
As the rate of drop/stop valve is closed, charge oil entering the cylinder has to go around the valve. Check ball (H) is raised and oil is channeled around the valve.

This action allows oil to enter the cylinder while the check ball prevents oil from leaving the cylinder. This allows the rockshaft to be raised and locked into position.

Continued on next page

OUO1082,00030C6 -19-22FEB12-3/4

LVAL12480 —UN—12NOV10

Pressure Relief Valve Operation:**A—Pressure Relief Valve****B—Check Ball****C—Dump Oil**

The pressure relief valve (A) is a spring loaded valve that opens when the rockshaft cylinder pressure becomes greater than **20680 kPa (3000 psi)**.

If too great of a load is placed on the rockshaft arms the check ball (B) moves against spring pressure, opens the valve and dumps oil (C) to the rockshaft sump housing.

OUO1082,00030C6 -19-22FEB12-4/4

LVAL12481 —UN—12NOV10

Diverter Valve (SN —710000)

Function:

The diverter valve option provides a means to shift hydraulic pressures (provided from 3-spool SCV) to either front hydraulic quick connects or rear hydraulic quick connects. The diverter valve is controlled by an electrical switch and solenoid valve.

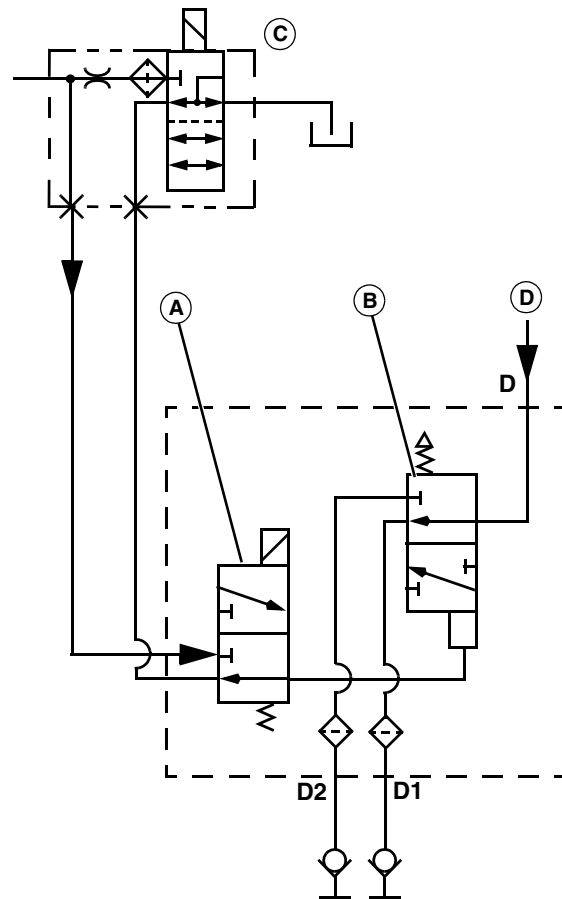
Theory:

The diverter valve block has four inlet ports, two sets of four outlet ports, four shift spools, a control pressure oil inlet port and return port, and a control solenoid.

The solenoid valve (A) controls pressurized oil from the PTO clutch solenoid valve, and provides control pressure to the four shift spools (B). The four shift spools operate at the same time. Each shift spool controls inlet port D pressure (from 3-spool SCV) to one of two outlet ports, D1 or D2.

A—Solenoid Valve
B—Shift Spool (4 used)

C—PTO Clutch Solenoid Valve
D—From Selective Control Valve (SCV)



LVAL12482 —UN—16NOV10

OOU01082,00030C7 -19-01MAR12-1/1

Diverter Valve (SN 710001—)

Function:

The diverter valve option provides a means to shift hydraulic pressures (provided from 2-spool SCV) to either front quick couplers or rear quick couplers. The valve is controlled by an electrical switch and solenoid valves.

NOTE: If the key switch is moved to the off position, the dual SCV lever will default to operating the

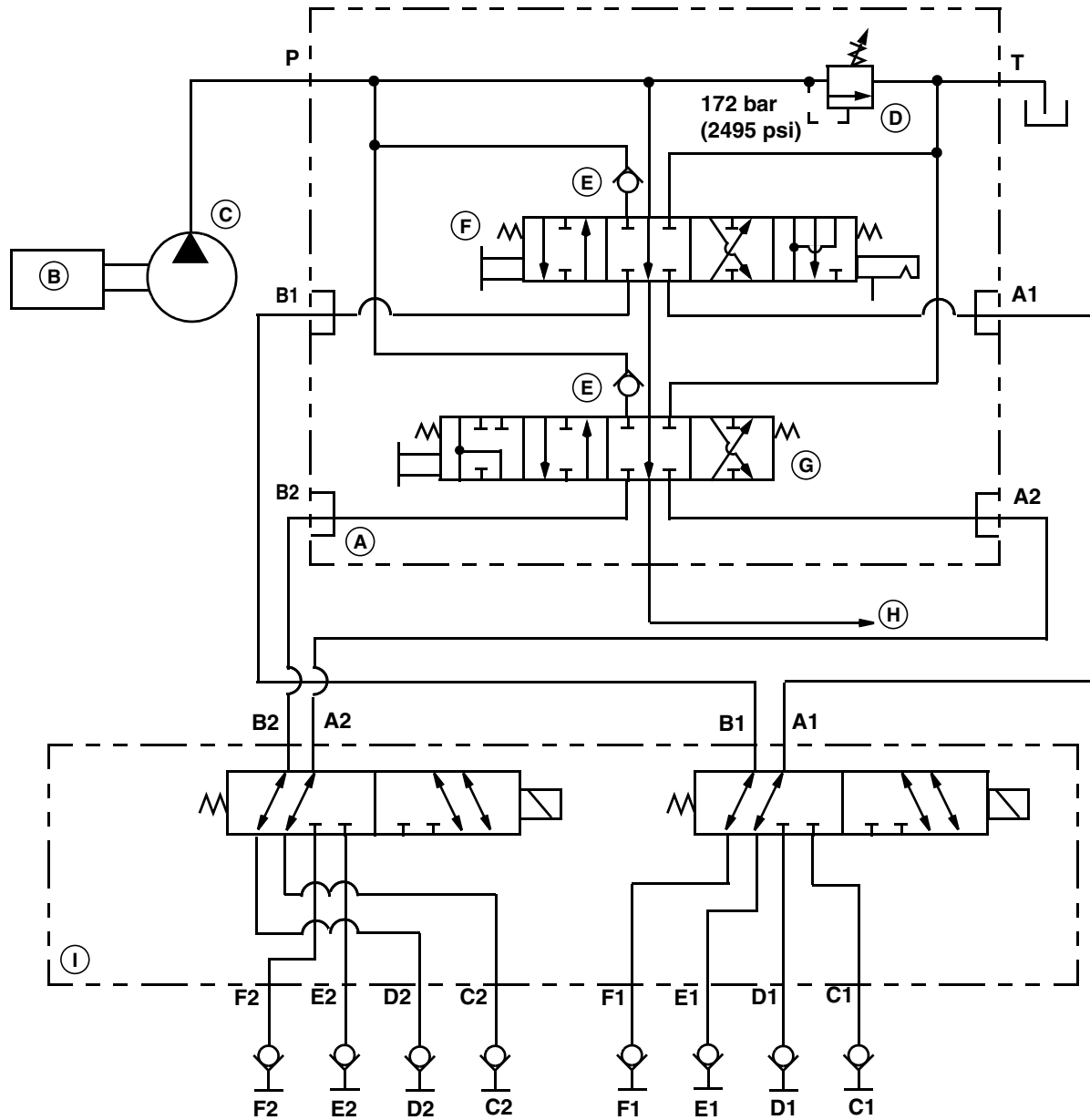
front quick couplers. The key switch must be moved to the run position and the diverter system re-activated to operate the rear couplers.

Theory:

The diverter valve block has four inlet ports, two sets of four outlet ports, and two control solenoids.

Continued on next page

OUO1082,00030C8 -19-02MAR12-1/2



A—2 Spool Selective Control Valve (SCV)
B—Engine

C—Implement Gear Pump
D—System Pressure Relief Valve

E—Load Check Valve
F—Spool 1
G—Spool 2
H—To Rockshaft

I—Diverter Valve

The control solenoids operate at the same time. Each controls inlet port A and B pressure (from 2-spool SCV) to one of two outlet port pairs, C and D, or E and F.

OOU1082,00030C8 -19-02MAR12-2/2

LV15496—UN—23FEB12

Hydrostatic (eHydro™) Troubleshooting

Symptom	Problem	Solution
Poor Hydrostatic Performance	Poor Transmission Performance.	Loss of charge pressure.
		Low hydraulic fluid level.
		Plugged filter.
		Improper current to solenoid valve.
		Solenoid valve malfunction.
		Plugged screens at solenoid valve.
		Worn rotating kit components.
		Parking brake is on.
		Ballasted too heavily.
		Wrong valve installed.
	Complete Loss of Transmission Power.	Loss of charge pressure.
		Low hydraulic fluid level.
		No current to solenoid valves.
		Failure of high-pressure components in pump or motor.
		Mechanical failure at 3-speed gearbox or drive line.
	Machine Creeps In Neutral.	Solenoid valve is getting current input.
		Threshold set-point incorrect (software setting).
		Improper neutral adjustment made in field.
		Worn servo piston components.
	Machine Moves When Started.	Solenoid valve is getting current input.
		Solenoid valve is stuck on.
	Excessive Pedal Movement To Begin Travel.	Threshold set-point incorrect (software setting).
		Sticky solenoid valve.

Continued on next page

SW03989,0000CA8 -19-12NOV10-1/2

Symptom	Problem	Solution
		Low charge pressure.
		Improper neutral adjustment made in field.
		Worn servo piston components.
	Loss of Charge Pressure.	Engine speed too low to develop required charge flow.
		Inefficient charge pump not providing required flow.
		Charge flow diverted to hydro (steering, MFWD, etc.).
		Extreme temperature increases demand but reduces flow.
		Reduction in hydro efficiency increases charge flow demand.
		Cut or worn seal ring on servo piston.
		Leakage past the charge pressure relief valve.

SW03989,0000CA8 -19-12NOV10-2/2

Rockshaft Hydraulics

Test Conditions:

- Machine sitting on level ground outdoors in an area clear of obstructions.
- Hydraulic oil in reservoir at proper level.

- Speed range selector in "NEUTRAL."
- Park brake engaged.
- Engine running at high idle.
- Sufficient weight on lift arms to allow self-lowering.
- Rockshaft rate of drop/stop valve fully open.

Symptom	Problem	Solution
Performance Checks Fail	With the rockshaft lift control in the full raise (rearward) position and then in the lower position, the lift arms do not raise to the full lift height and then fully lower.	<p>Perform Rockshaft Position Feedback Adjustment. (See Rockshaft Position Feedback Linkage Adjustment in Section 90, Group 30.)</p> <p>Does the rockshaft pass the lift cycle and leakage tests? (See Rockshaft Lift Cycle Test in Section 90, Group 30.), and (see Rockshaft Leakage Test in Section 90, Group 30.)</p>

SW03989,0000CA9 -19-16NOV10-1/1

Hydraulic System Bleed Procedure

Reason:

To remove air trapped in the hydraulic system which will prevent proper operation.

Procedure:

IMPORTANT: Avoid Damage! If contamination is found in hydraulic system filter or inside reservoir, flush entire hydraulic system.

NOTE: Fill the new hydraulic oil filter with new oil before installing.

1. Install a new hydraulic oil filter.
2. Fill the transaxle with specified JDM J20C (preferred) or J20D oil to the proper level on dipstick.

3. Raise machine front end and support on suitable stands.
4. Start the engine and run at low idle.
5. Slowly turn the steering wheel left and right until wheels turn smoothly indicating that any trapped air has been bled back to the reservoir.
6. Operate rockshaft several times until it operates smoothly.
7. Stop the engine and check the hydraulic reservoir oil level. Fill as needed. Check all line connections for leaks; tighten if necessary.
8. Lower the machine to the ground.
9. eHydro™ model, drive machine in forward and reverse several times until transmission operates smoothly.

SW03989,0000CAA -19-11FEB11-1/1

Rate of Drop/Stop Valve Adjustment

Reason:

To ensure that lift arms lower rear attachment completely and lower it at a safe rate of speed.

Equipment:

- BW13586 Ballast Box

Procedure:

1. Park machine on a level surface and set park brake.
2. Shift transmission to "neutral".
3. Install BW13586 ballast box, or approximately 227 kg (500 lb.), on the three point hitch.

Specification

Approximate—Weight..... 227 kg (500 lb)

4. Start engine and run at fast idle.

5. Put lift control lever in full UP position.
6. Raise weight as high as it will go.
7. Close rate of drop/stop valve.
8. Put lift control lever in full DOWN position.
9. Open rate of drop stop valve 1-1/2 to 2 turns.
10. Time duration of drop cycle from full up to full down.

Specification

Rockshaft Drop—Time.....2-1/2 to 3 seconds

Results:

If the weight lowers slower than specified time, open rockshaft rate of drop/stop valve until specification is met. If weight drop time will not meet specification, the rate of drop/stop valve may be clogged or faulty, or the rockshaft control valve may be faulty. (See Rockshaft Disassembly and Assembly in Section 90, Group 35.)

SW03989,0000CAB -19-12NOV10-1/1

Lift Arms Adjustment

Reason:

To ensure that lift arms are operating through the correct range of motion.

Procedure:

1. Park machine on a level surface and set park brake.
2. Shift transmission to NEUTRAL.
3. Start engine and use hydraulics to rotate rockshaft to full UP position.

4. Using angle gage, check lift arms against specifications. If not correct, remove lift arm and reset. (See Rockshaft Lift Arms Removal and Installation in Section 90, Group 35.)
5. Compare angle of second lift arm with first, they should be within 5° of each other. If not, reset lift arms on splines and/or replace rockshaft.

Specification

Lift Arm Raise—Angle.....50°
 Lift Arm Lower—Angle.....20°
 Total Lift Arm—Range.....70°
 Between Arms—Variance
 (maximum).....5°

SW03989,0000CAC -19-11NOV10-1/1

System Pressure/Flow Test

Reason:

To ensure that hydraulic pump pressure and flow are maintained at sufficient levels for rockshaft and SCV attachment operation, and to determine if hydraulic pump is worn.

Equipment:

- JT05689—Adapter Fitting (1-1/16-12 M 37° X 1-14 F ORFS) (2 Required)
- JT03012—Adapter Fitting (3/4 F NPT X 1-1/16-12 F 37° Sw) (2 Required)
- JT05984—In-Line Flow Meter With Pressure Gauge
- JT03377—Hose (3/4 M NPT X 3/4 M NPT X 10') (2 Required)

Procedure:

1. Park machine on a level surface and set park brake.
2. Shift transmission to NEUTRAL.

⚠ CAUTION: Avoid Injury! Make sure to relieve system pressure before loosening any system lines or hoses.

3. Cycle all controls to relieve any pressure that may be in the hydraulic system.

4. Remove hydraulic tube between rear pump and SCV valve.
5. Connect test equipment between rear pump and SCV valve. Open valve on flowmeter fully.
6. Start engine and run at fast idle.

⚠ CAUTION: Avoid Injury! Do not close valve on flowmeter fully. Pump pressure may exceed working pressure of hose.

7. Slowly close valve on flowmeter until working pressure is reached. Record flow reading on gauge.

Specification

System—Relief
Pressure..... 17 240 kPa (2500 psi)
System—Flow..... 32.5 L/min (8.6 gpm)

Results:

- Pressure too Low: If system pressure reading cannot be reached, mesh filter may be restricted. Suction line may be restricted or leaking air. Pump may be worn. (See [Hydraulic Gear Pump](#) in Section 90, Group 35.)
- Flow too low: Mesh filter may be restricted. Suction line may be restricted or leaking air. Pump may be worn. (See [Hydraulic Gear Pump](#) in Section 90, Group 35.)

SW03989,0000CAD -19-11NOV10-1/1

System Pressure Adjustment

NOTE: On machines equipped with a manifold block in place of an SCV, system pressure is set at the factory, and should not require adjustment.

Reason:

To adjust hydraulic pressure so that system pressure is maintained at correct levels to perform work without causing damage to the hydraulic system.

Equipment:

- JT05689—Adapter Fitting (1-1/16-12 M 37° X 1-14 F ORFS) (2 Required)
- JT03012—Adapter Fitting (3/4 F NPT X 1-1/16-12 F 37° Sw) (2 Required)
- JT05984—In-Line Flow Meter With Pressure Gauge
- JT03377—Hose (3/4 M NPT X 3/4 M NPT X 10') (2 Required)

Procedure:

1. Park machine on a level surface and set park brake.
2. Shift transmission to NEUTRAL.

CAUTION: Avoid Injury! Make sure to relieve system pressure before loosening any system lines or hoses.

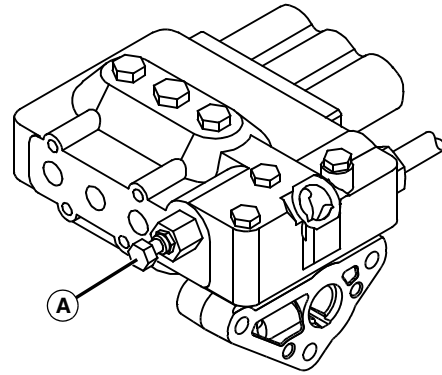
3. Cycle all controls to relieve any pressure that may be in the hydraulic system.
4. Remove hydraulic tube between rear pump and SCV valve.
5. Connect test equipment between rear pump and SCV valve. Open valve on flowmeter fully.
6. Start engine and run at high idle.
7. Move SCV control lever to open SCV valve to a closed work port (dead head).
8. Check pressure reading on gauge.

Specification

System—Relief
Pressure..... 17 240 kPa (2500 psi)

Results:

- Pressure too low: Turn system pressure relief valve (A) clockwise until pressure reading is within specification.



A—Pressure Relief Valve

NOTE: If system pressure will not meet specification, pump may be worn. Perform system pressure/flow test (See System Pressure/Flow Test in Section 90, Group 30.)

- Pressure too high: Turn system pressure relief valve counterclockwise until pressure reading is within specification.

LVAL12483 —UN—12NOV10

SW03989,0000CAE -19-11NOV10-1/1

Steering Pressure Test

Reason:

To ensure that steering pump pressure is maintained at correct level for steering without causing damage to the system, and to determine if hydraulic pump is worn.

Equipment:

- JT03375—Adapter Fitting (7/16-20 M 37° X 9/16-18 M ORFS)
- JT03117—0-14000 kPa (0-2000 psi) Pressure Gauge
- JT03017 Hose w/Quick Disconnect Fitting

Procedure:

1. Park machine on a level surface and set park brake.
2. Shift transmission to NEUTRAL.

CAUTION: Avoid Injury! Make sure to relieve system pressure before loosening any system lines or hoses.

3. Remove hydraulic hose on left side of steering cylinder.
4. Attach gauge to left steering hose.

NOTE: Turning steering wheel to the right will cause hydraulic oil to leak out of disconnected cylinder port. Turn wheel only to left when performing test.

5. Start engine and run at high idle.
6. Turn steering wheel to the left. While turning wheel, check pressure reading on gauge.

Specification

Steering Test—Pressure
(± 10%)..... 10 340 kPa (1500 psi)

Results:

- No pressure: Steering hoses may be incorrectly connected to the SCU. Check hose connections.
- Pressure too low: Relief valve in SCU may be stuck open or defective; perform steering system test, (See Steering System Test in Section 100, Group 25.), or gear pump may be worn; disassemble and inspect pump. (See Hydraulic Gear Pump in Section 90, Group 35.)
- Pressure too high: Relief valve in SCU may be clogged or defective.

SW03989,0000CAF -19-11NOV10-1/1

Charge Pressure Test—eHydro™

(See Charge Pump Pressure Test and Adjustment in Section 70, Group 35.)

SW03989,0000CB0 -19-11NOV10-1/1

PTO Clutch Pressure Test

Reason:

To test hydraulic pressure to the main PTO. If correct pressure is supplied to the clutch, clutch malfunctions can be isolated to the clutch assembly. If low or no pressure is supplied to the clutch, clutch malfunctions can be isolated to the hydraulic system.

Equipment:

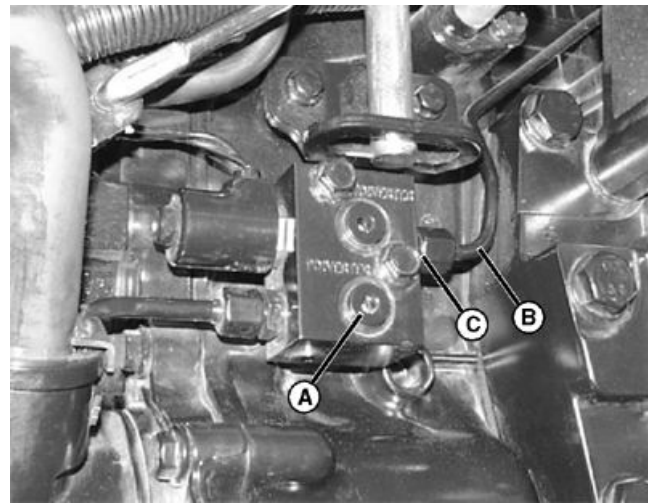
- 0—2000 kPa; or, 0—300 psi Pressure Gauge

Procedure:

1. Park machine on a level surface and set park brake.
2. Shift transmission to NEUTRAL.
3. Place PTO switch in OFF position.

CAUTION: Avoid Injury! Make sure to relieve system pressure before loosening any system lines or hoses.

4. Cycle all controls to relieve any pressure that may be in the hydraulic system.
5. Locate the PTO clutch solenoid valve on left side of the machine (above hydraulic suction filter).
6. Remove plug from PTO clutch solenoid valve pressure port (A).
7. Install quick connect fitting or equivalent. Install hose and pressure gauge to fitting.
8. Start machine.
9. Check pressure gauge for charge pressure.
10. Stop machine.
11. Cycle all controls to relieve any pressure that may be in the hydraulic system.
12. Remove test gauge and fittings.



A—Pressure Port
B—PTO Clutch Supply Line

C—Supply Oil Port

13. Install plug in port (A).

Results:

- Pressure is within specification: Check PTO clutch solenoid valve for proper operation.
- Disconnect PTO clutch supply line (B) from valve body.
- Use appropriate fittings to connect pressure gauge to PTO clutch supply oil port (C).
- Start machine, engage PTO and check for pressure reading.
- If charge pressure is not present or is low, repair or replace PTO clutch solenoid valve. If charge pressure is present, go to PTO clutch for repair.
- No pressure or pressure is low: Check charge pressure.

Specification

Charge—Pressure..... 1725—2000 kPa (250—290 psi)

SW03989,0000CB1 -19-05NOV10-1/1

LVAL12484—UN—04NOV10

Rockshaft Lift Cycle Test

Reason:

To ensure that hydraulic system is functioning correctly and capable of lifting rated load.

Equipment:

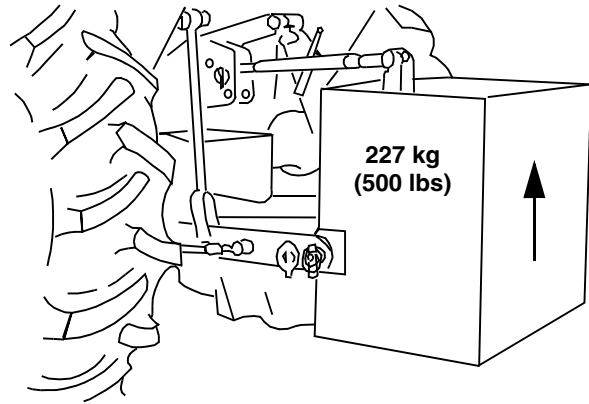
- BW13586 Ballast Box

Procedure:

1. Park machine on a level surface and set park brake.
2. Shift transmission to NEUTRAL.
3. Install ballast box, or approximately **227 kg (500 lb.)**, on the three point hitch.
4. Open rate of drop/stop valve completely.
5. Start engine and run at fast idle.
6. Move lift control lever to full UP position.
7. Time duration of lift cycle from full down to full up.

Specification

Rockshaft Lift—Time.....2-1/2 to 3 seconds



BW13586 Ballast Box

Results:

If the weight raises slower than specified there may be internal leakage in the lift cylinder or rockshaft control valve.

SW03989,0000CB2 -19-05NOV10-1/1

LVAL12485—UN—12NOV10

Rockshaft Leakage Test

Reason:

To ensure that hydraulic system is functioning correctly and capable of lifting rated load.

Equipment:

- BW13586 Ballast Box

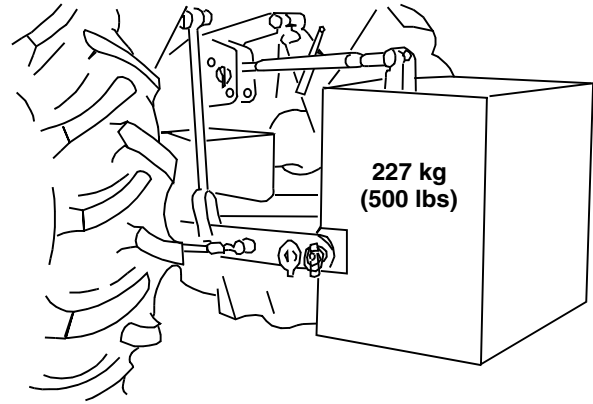
Procedure:

1. Park machine on a level surface and set park brake.
2. Shift transmission to NEUTRAL.
3. Install BW13586 ballast box, or approximately 227 kg (500 lb.), on the three point hitch.

Specification

Approximate—Weight..... 227 kg (500 lb)

4. Start engine and run at fast idle.
5. Put lift control lever in full UP position.
6. Raise weight as high as it will go.
7. Close rate of drop/stop valve.
8. Shut off engine.
9. Measure distance weight drops in five minutes.
10. Restart engine, open rate of drop/stop valve fully and raise weight to full UP position.
11. Shut off engine.
12. Measure distance weight drops in five minutes.



BW13586 Ballast Box

Specification

Drop (Maximum)—5
minutes..... 51 mm (2 in.)

Results:

If the weight drops farther than specified distance with the stop/drop valve closed (first test) there may be leakage in the cylinder, relief valve or drop/stop valve.

If the weight drops farther with the drop/stop valve open (second test) than it did in the first test, there may be leakage in the rockshaft control valve.

SW03989,0000CB3 -19-12NOV10-1/1

LVAL12486—UN—12NOV10

Rockshaft Position Feedback Linkage Adjustment

Reason:

To ensure that draft arms raise to maximum lift height without engaging relief valve.

Procedure:

1. Position machine on a level surface and set park brake.
2. Shift transmission to NEUTRAL.
3. Position lift control lever in the full forward (down) position and provide enough weight on lift arms to allow self lowering.
4. Start engine.

5. Move lift control lever to full raise position (back).
6. Lift arm should raise fully without engaging the relief valve. Check that there is slack above the vertical height. See specification.

Specification

Vertical Height Slack
—Free Length..... 25.4 mm (1 in.)

Results:

If specification is not met, lengthen the lift arm position feedback rod to increase, or shorten to reduce the maximum height until within specification. The relief valve should not engage.

SW03989,0000CB4 -19-12NOV10-1/1

Hydraulic Gear Pump

Removal:

1. Remove engine side panels.
2. Put a drain pan under the pumps to catch oil.
3. Disconnect suction manifold (A) and pressure tube (B) from pump to be removed.
4. Each pump has two socket head cap screws securing it to the engine drive housing, and two through socket head cap screws to the other pump.
5. Remove the pump.

Installation:

1. Install new body seals on the suction fittings and pressure tubes. Secure to the pump with cap screws. Tighten to specification.

Specification

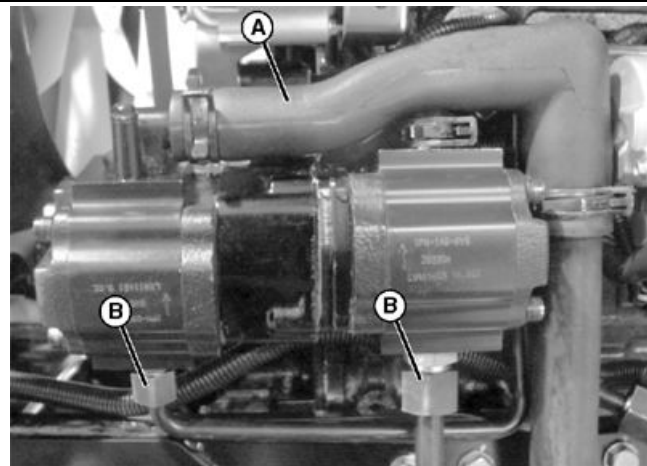
Cap Screw—Torque..... 9 N·m (84 lb.-in.)

2. Install new gaskets on the pump mounting flanges.
3. Align the splines on the pump input shaft with splines on the engine drive. Insert the pump into the engine housing.
4. Secure each pump with socket head cap screws. Tighten cap screws to specification.

Specification

Cap Screw—Torque..... 22 N·m (192 lb.-in.)

5. Inspect the suction manifold for damage or cracking. Replace if necessary.



A—Suction Manifold

B—Pressure Tube

Gear Pump Disassembly and Inspection:

IMPORTANT: Avoid Damage! Replace all body seals, gaskets, and seals any time the pump is opened. Used or damaged body seals, gaskets, and seals will leak.

NOTE: Available pump components are serviced only in the seal kit for the pump. Verify the availability of pump components before disassembling the pump.

1. Remove the pump from the engine.

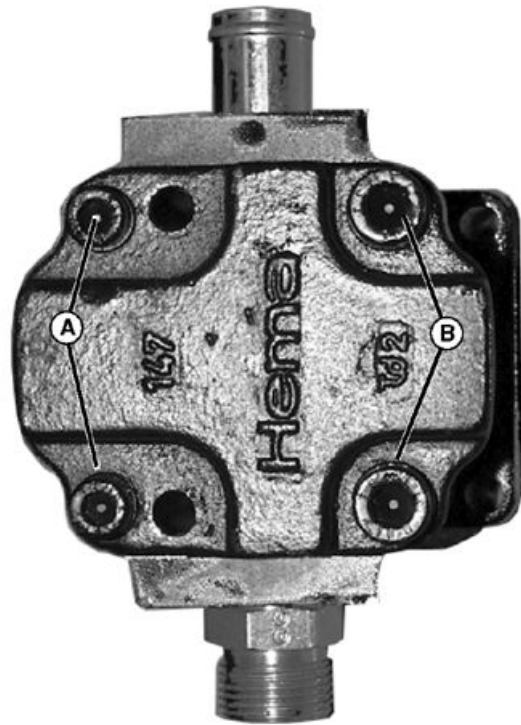
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OOU1082,00030C9 -19-22FEB12-1/13

LVAL12487 —UN—04NOV10

2. Remove two M8 socket head cap screws (A) and two M10 socket head cap screws (B) securing the rear pump cover to the pump body and front cover.
3. Remove the rear pump cover.

A—M8 Socket Head Cap Screw (2 used) B—M10 Socket Head Cap Screw (2 used)



LVAL12488 —UN—04NOV10

OUO1082,00030C9 -19-22FEB12-2/13

4. Inspect the inside of the pump cover (C) for wear or damage.

C—Pump Cover



LVAL12489 —UN—04NOV10

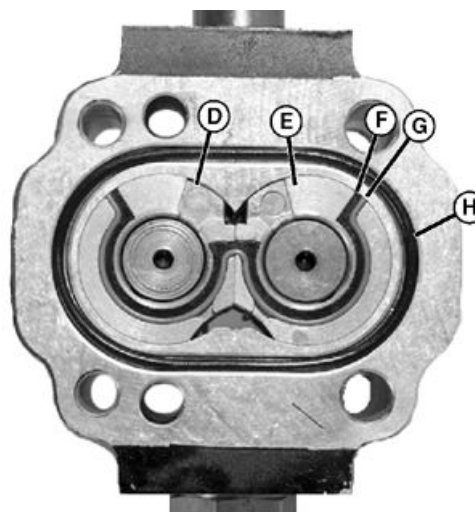
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OUO1082,00030C9 -19-22FEB12-3/13

5. Remove the seal (F) and backing ring (G) from the pump bushings (D and E).
6. Replace the body seal (H).

D—Pump Bushing
E—Pump Bushing
F—Seal

G—Backing Ring
H—Seal



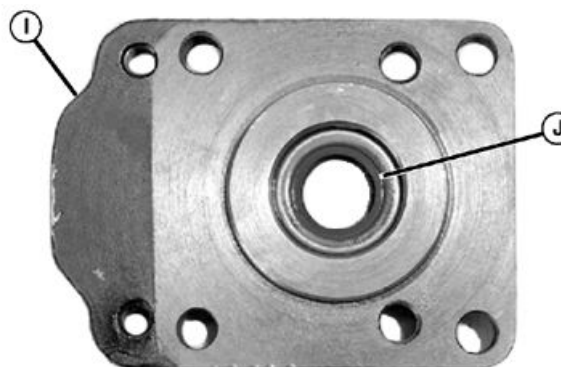
LVAL12490 —UN—04NOV10

OUO1082,00030C9 -19-22FEB12-4/13

7. Remove the front cover (I).
8. Inspect the outside of the front cover for wear or damage.
9. Inspect the shaft seal (J) for cracks, wear, or damage. If necessary replace the shaft seal.

I— Front Cover

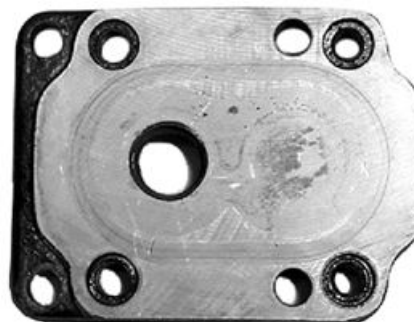
J— Shaft Seal



LVAL12491 —UN—04NOV10

OUO1082,00030C9 -19-22FEB12-5/13

10. Inspect the inside of the front cover for scoring, wear, or damage.



Inspect Front Cover

LVAL12492 —UN—04NOV10

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OUO1082,00030C9 -19-22FEB12-6/13

11. Remove the seal (F) and backing ring (G) from the pump bushings (D and E).

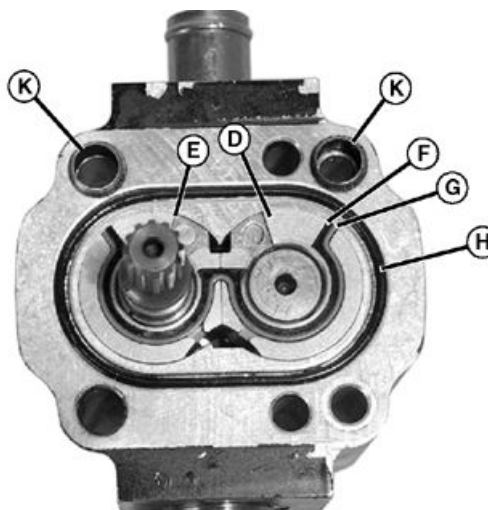
NOTE: The dowels may remain in either the pump cover or body when the cover is removed.

12. Inspect two alignment dowels (K) for damage.
Replace if necessary.

13. Replace the body seal (H).

D—Pump Bushing
E—Pump Bushing
F—Seal

G—Backing Ring
H—Body Seal
K—Alignment Dowel (2 used)



LVAL12493—UN—04NOV10

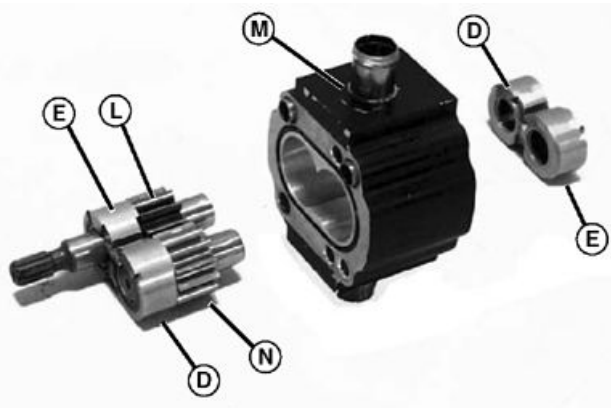
OUO1082,00030C9 -19-22FEB12-7/13

14. Note the location and markings on the pump bushings (D and E) to assure correct orientation at assembly.

15. Remove the bushings, drive gear (L), and driven gear (N) from the pump housing (M).

D—Pump Bushing
E—Pump Bushing
L—Drive Gear

M—Pump Housing
N—Driven Gear



LVAL12494—UN—04NOV10

OUO1082,00030C9 -19-22FEB12-8/13

16. Remove the bushings (D and E) from the gears (L and N).

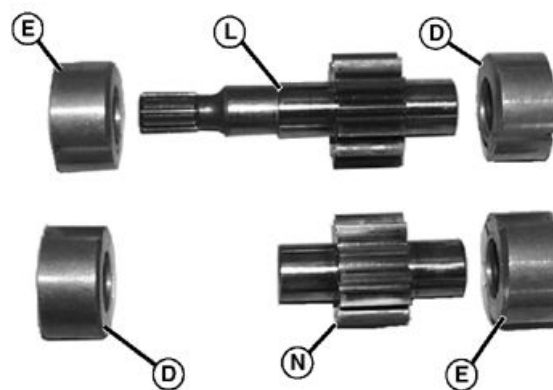
17. Inspect the gear and bushing faces for scoring, scratches, or damage.

18. Inspect the drive gear (L) shaft splines and bearing surfaces for wear or damage.

19. Inspect the gear shaft bearing surfaces for wear or damage.

20. Inspect inside of bushings for scoring or excessive scratching.

21. Inspect pump housing internal surfaces for scoring or scratching. Replace pump if damaged.



D—Pump Bushing
E—Pump Bushing

L—Drive Gear
N—Driven Gear

LVAL12495—UN—04NOV10

Continued on next page

OUO1082,00030C9 -19-22FEB12-9/13

Assembly:

1. Lubricate all parts with hydraulic oil before assembly.

NOTE: The bushings should be oriented so that the opening formed by the seal faces the top of the pump.

2. Install the pump bushings (A, B) into the pump housing bore as shown. Push the bushings in by hand until they are flush with the back of the pump housing.

A—Pump Bushing

B—Pump Bushing



LVAL12496 —UN—04NOV10

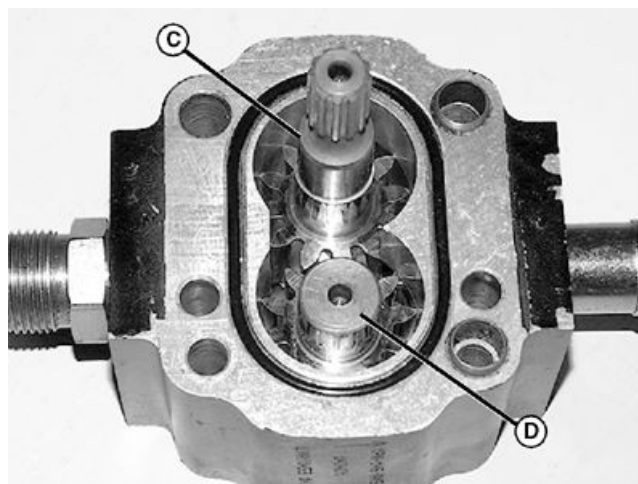
OUO1082,00030C9 -19-22FEB12-10/13

NOTE: The driven gear is symmetrical and can be placed in the pump body either end first.

3. Lay the back of the pump body on a clean, flat surface. Install the drive gear (C) and driven gear (D) into the pump body and rear bushings.

C—Drive Gear

D—Driven Gear



LVAL12497 —UN—04NOV10

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OUO1082,00030C9 -19-22FEB12-11/13

NOTE: The bushings should be oriented so that the opening formed by the seal faces the top of the pump.

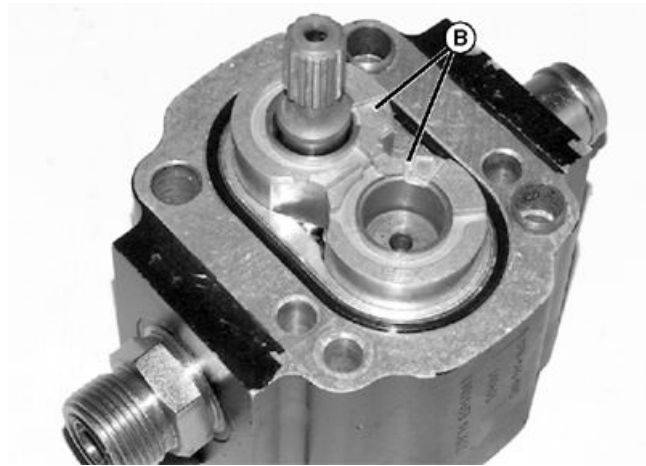
4. Install the pump bushings (B) into the pump housing, and onto the drive gear and idler gear shafts.

NOTE: The seal and the backing ring **MUST** be installed in the correct orientation. The flat side of the seal must face the bushings. The flat side of the backing ring must face the pump cover.

5. Replace the seal backing ring and seal in the pump bushings.
6. Replace the front and rear body seals.
7. Install front cover over the drive gear shaft and onto pump body.
8. Install rear cover and secure the covers with two M8 and two M10 socket head cap screws. Tighten cap screws to specification.

Specification

M8 Cap Screw—Torque.....	22 N·m (195 lb.-in.)
M10 Cap Screw—Torque.....	43 N·m (32 lb.-ft.)



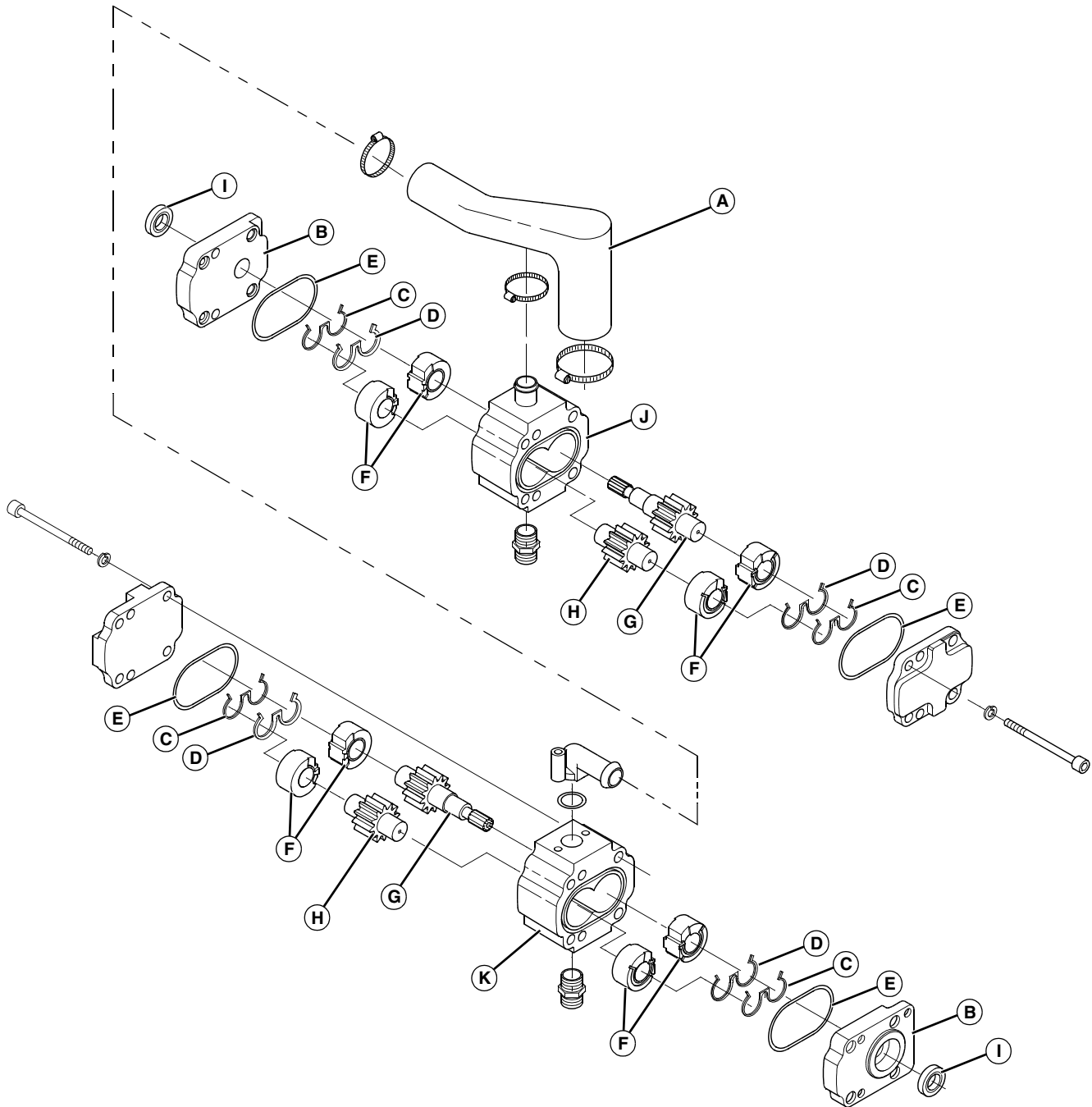
B—Pump Bushing

9. Install the pump to the engine.

LVAL12498—UN—04NOV10

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OUO1082,00030C9 -19-22FEB12-12/13



A—Suction Manifold
 B—Front Cover (2 used)
 C—Seal (4 used)
 D—Backing Ring (4 used)

E—Body Seal (4 used)
 F—Bushing (8 used)
 G—Drive Gear (2 used)
 H—Driven Gear (2 used)

I— Drive Gear Shaft Seal (2 used)
 J— Rear Pump Body (Rockshaft)
 K—Front Pump Body (Steering)

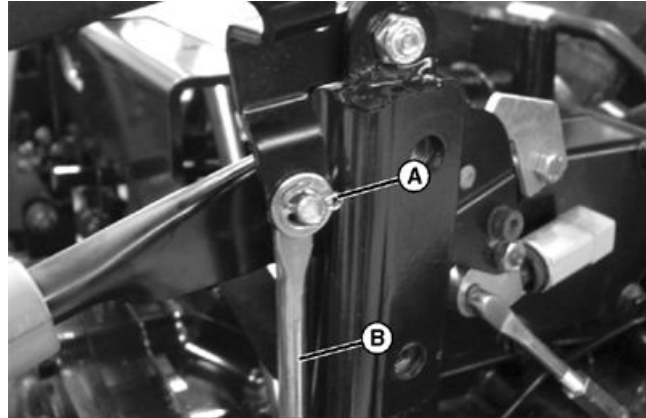
OUO1082,00030C9 -19-22FEB12-13/13

LVAL12499 —UN—12NOV10

Rockshaft Removal and Installation

Removal

1. Remove seat and seat support. (See Seat and Seat Support Removal and Installation in Section 120, Group 10.)
2. Remove seat closeout panel. (See Seat Closeout Removal and Installation in Section 120, Group 10.)
3. Remove rear fenders. (See Rear Fenders Removal and Installation in Section 120, Group 10.)
4. Disconnect and lay aside any electrical wires running over rockshaft.
5. Remove cotter pin (A) and washer. Disconnect MFWD linkage (B).



A—Cotter Pin

B—MFWD Linkage

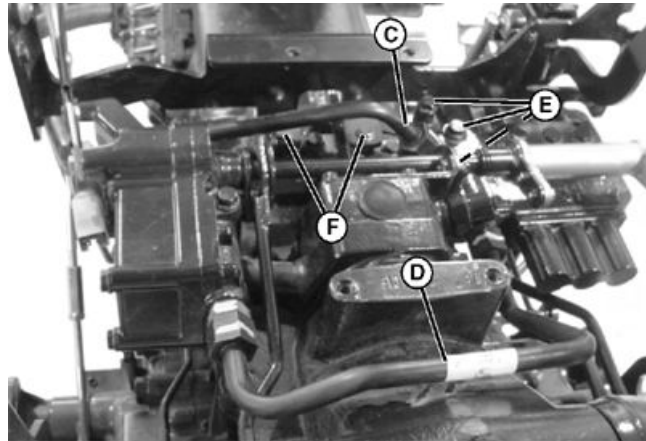
LVAL12500—UN—04NOV10

OUO1082,00030CA -19-22FEB12-1/2

6. Disconnect supply line (C) and rockshaft line (D). Remove rockshaft hydraulic line.
7. Remove three cap screws (E) securing SCV to transmission case manifold.
8. Remove two cap screws (F) retaining bracket to front of rockshaft.
9. Remove SCV valve and seat bracket as an assembly.
10. Remove all cap screws securing rockshaft to differential housing.

NOTE: Rockshaft is heavy! Use a hoist or have an assistant help remove rockshaft.

11. Remove rockshaft.

C—Supply Line
D—Rockshaft LineE—Cap Screw (2 used)
F—Cap Screw (2 used)

LVAL12501—UN—04NOV10

Installation

Installation is performed in the reverse order of removal.

- Clean sealing surfaces of rockshaft and final drive housing. Install a new gasket on transaxle rockshaft mounting surface.
- If lift arms have been removed they must be reset. (See Lift Arms Adjustment in Section 90, Group 30.)
- Replace O-rings between SCV and transmission case manifold.
- Tighten tube nuts and cap screws to specification.

Specification

Tube Nut—Torque.....	69 N·m (51 lb.-ft.)
8.8 Grade Cap	
Screw—Torque.....	55 N·m (40 lb.-ft.)
10.9 Grade Cap	
Screw—Torque.....	80 N·m (60 lb.-ft.)

OUO1082,00030CA -19-22FEB12-2/2

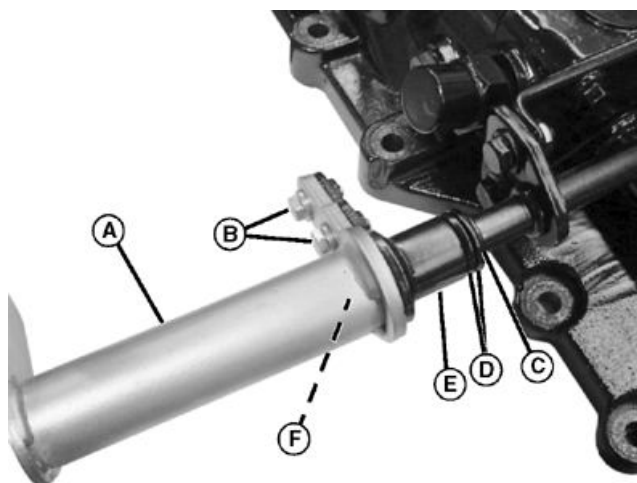
Rockshaft Disassembly and Assembly

Disassemble:

1. Remove two cap screws (B) that retain control lever (A) to lever arm (E). Remove control lever.
2. Remove lock nut (F), lever arm, two belleville washers (D), and one flat washer (C).

A—Control Lever
B—Cap Screw (2 used)
C—Flat Washer

D—Belleville Washer (2 used)
E—Lever Arm
F—Lock Nut



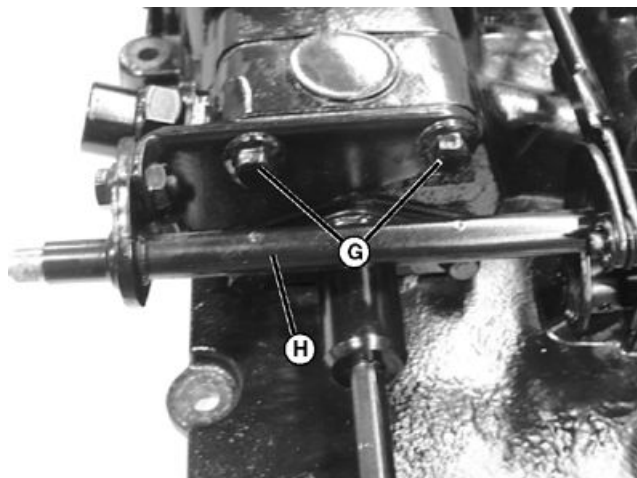
LVAL12502 —UN—04NOV10

OUO1082,00030CB -19-22FEB12-1/33

3. Remove two cap screws (G).
4. Remove shaft support tube (H) and bracket assembly.

G—Cap Screw (2 used)

H—Shaft Support Tube

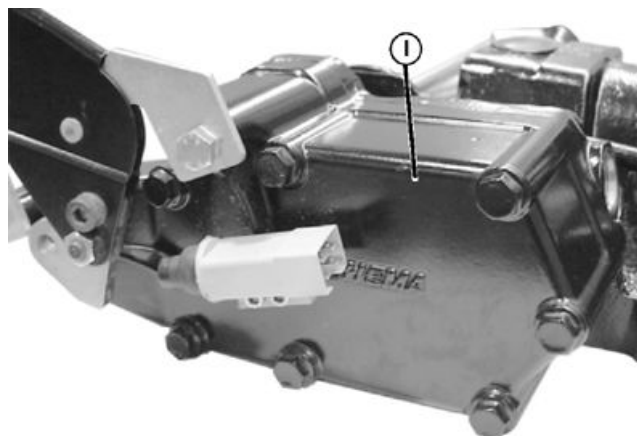


LVAL12503 —UN—04NOV10

OUO1082,00030CB -19-22FEB12-2/33

5. Remove six cap screws and rockshaft valve cover (I).

I— Valve Cover



LVAL12504 —UN—04NOV10

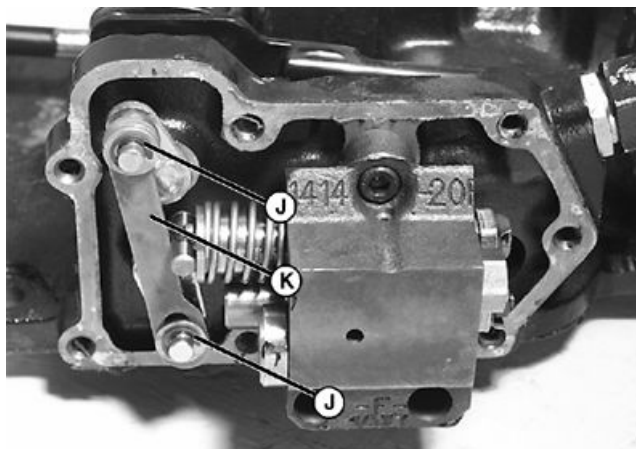
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OUO1082,00030CB -19-22FEB12-3/33

6. Remove two snap rings (J), two flat washers, and link (K).

J— Snap Ring (2 used)

K—Link



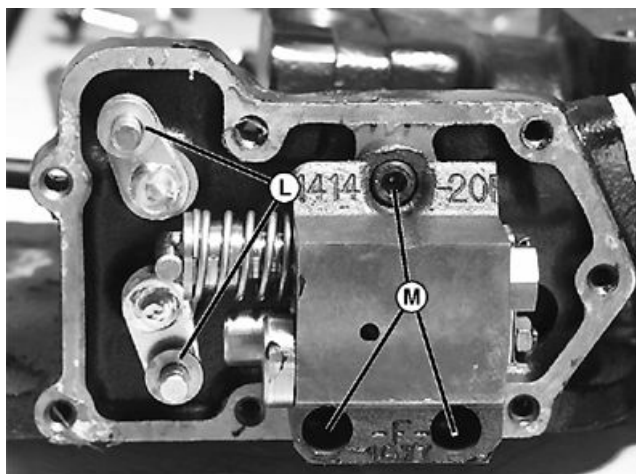
LVAL12505 —UN—04NOV10

OUO1082,00030CB -19-22FEB12-4/33

7. Remove two washers (L).
8. Remove three socket head cap screws (M) and rockshaft control valve.

L— Washer (2 used)

M—Socket Head Cap Screw (3 used)

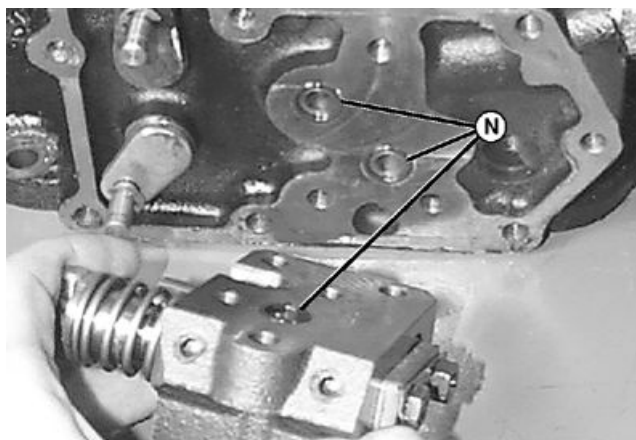


LVAL12506 —UN—04NOV10

OUO1082,00030CB -19-22FEB12-5/33

9. Replace three O-rings (N).

N—O-ring (3 used)



LVAL12507 —UN—04NOV10

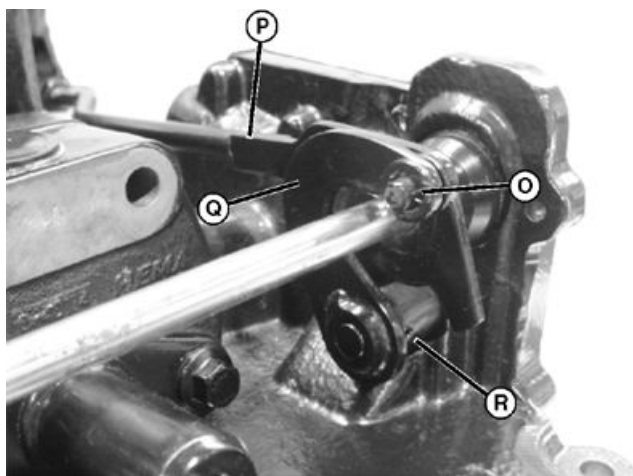
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OUO1082,00030CB -19-22FEB12-6/33

10. Remove cotter pin (O) and washer, and disconnect position feedback rod (P) from feedback lever (Q).
11. Remove spring pin (R) and feedback lever.

O—Cotter Pin
P—Feedback Rod

Q—Feedback Lever
R—Spring Pin



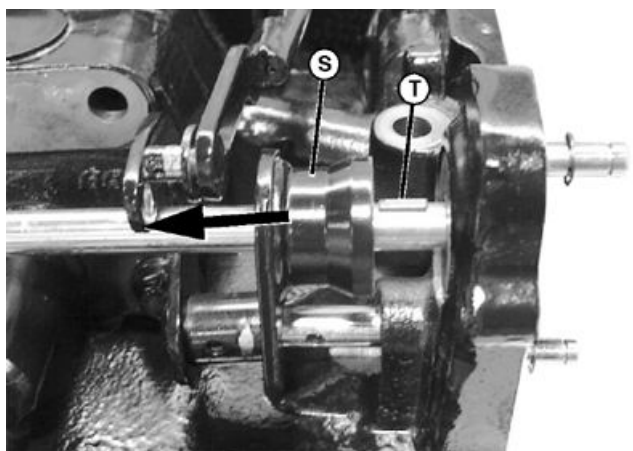
LVAL12508—UN—04NOV10

OUO1082,00030CB -19-22FEB12-7/33

12. Slide limiter (S) away from rockshaft housing. Remove woodruff key (T).

S—Limiter

T—Woodruff Key



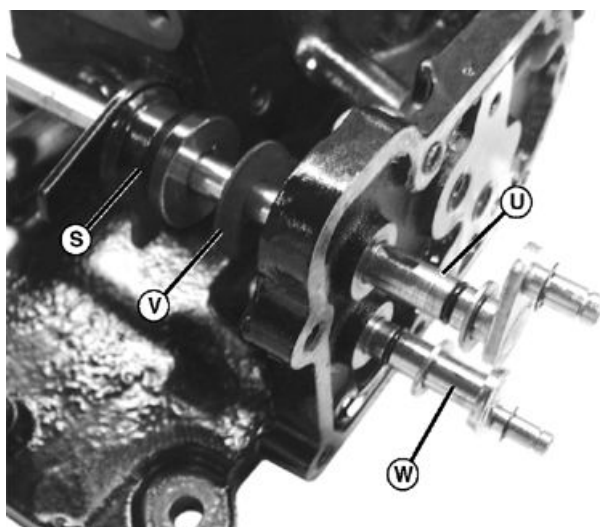
LVAL12509—UN—04NOV10

OUO1082,00030CB -19-22FEB12-8/33

13. Remove lift control shaft (U) from rockshaft housing. Remove limiter (S) and rubber washer (V).
14. Remove position feedback shaft (W) from housing.
15. Replace O-rings on lift control and position feedback shafts.

S—Limiter
U—Lift Control Shaft

V—Rubber Washer
W—Position Feedback Shaft



LVAL12510—UN—04NOV10

Continued on next page

OUO1082,00030CB -19-22FEB12-9/33

16. Remove relief valve (X).
17. Remove plastic cap (Y) on top of cylinder head.

X—Relief Valve

Y—Plastic Cap



LVAL12511 —UN—04NOV10

OUC1082,00030CB -19-22FEB12-10/33

18. Replace two O-rings on relief valve.



O-rings on Relief Valve

LVAL12512 —UN—04NOV10

OUC1082,00030CB -19-22FEB12-11/33

19. Remove plug and spring.



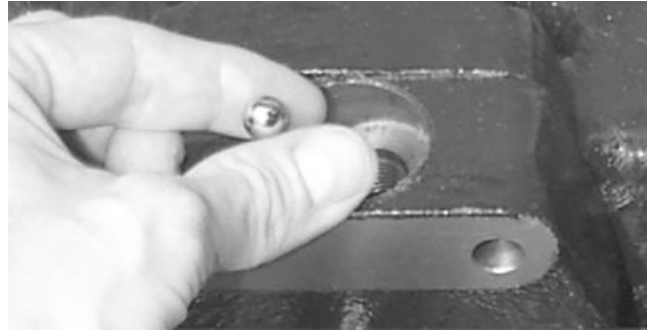
Check Valve Plug and Spring

LVAL12513 —UN—04NOV10

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OUC1082,00030CB -19-22FEB12-12/33

20. Remove ball.



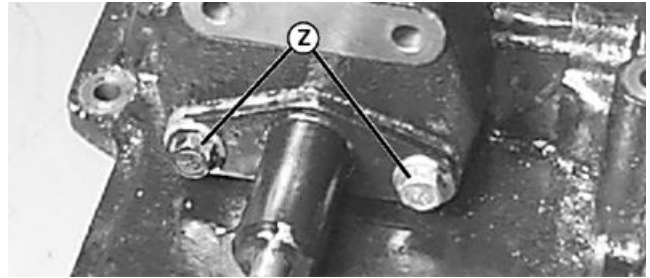
Check Valve Ball

LVAL12514 —UN—04NOV10

OUO1082,00030CB -19-22FEB12-13/33

21. Remove two cap screws (Z) and rate of drop/stop valve stem.

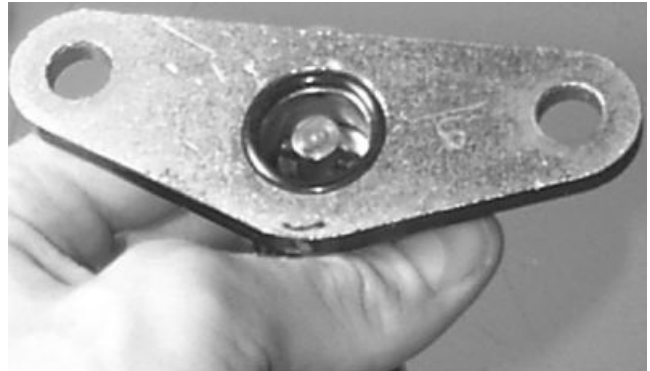
Z—Cap Screw (2 used)



LVAL12515 —UN—04NOV10

OUO1082,00030CB -19-22FEB12-14/33

22. Replace O-ring in end of drop/stop valve stem.



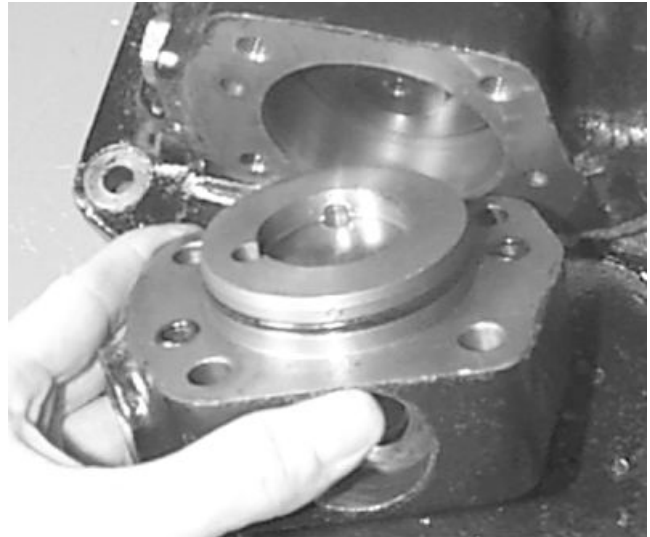
Drop/Stop Valve O-ring

LVAL12516 —UN—04NOV10

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OUO1082,00030CB -19-22FEB12-15/33

23. Remove cylinder head. Replace O-rings in cylinder head.



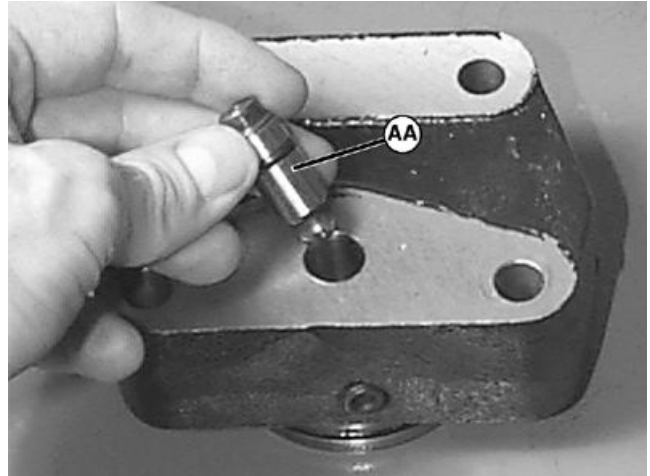
Cylinder Head O-rings

LVAL12517 —UN—04NOV10

OUO1082,00030CB -19-22FEB12-16/33

24. Remove rate of drop/stop valve spool (AA). Replace O-ring on spool.

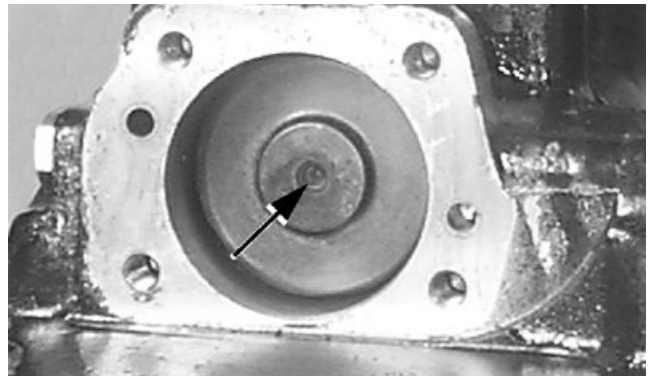
AA—Drop/Stop Valve Spool



LVAL12518 —UN—04NOV10

OUO1082,00030CB -19-22FEB12-17/33

25. Place a suitable bolt in threaded hole in end of piston. Remove rockshaft piston.



Rockshaft Piston

LVAL12519 —UN—04NOV10

Continued on next page

OUO1082,00030CB -19-22FEB12-18/33

26. Replace inner and outer piston rings.

Assemble:

IMPORTANT: Avoid Damage! Replace all O-rings and seals. Used or damaged O-rings and seals will leak.

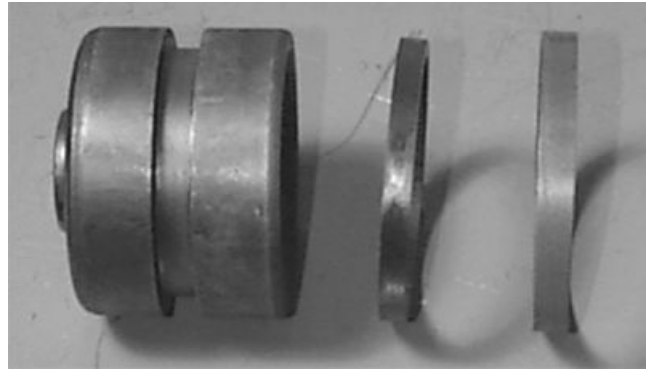
NOTE: When assembling, DO NOT lubricate Belleville washers or lift control lever friction surfaces.

1. Install a new inner and outer piston rings.

IMPORTANT: Avoid Damage! Use care when installing piston into cylinder bore to prevent damage to piston rings. Be sure that piston rings are centered in cylinder bore and properly seated in piston ring groove during installation.

2. Lubricate piston and rings liberally with hydraulic oil. Using a plastic mallet, install piston into cylinder bore.

3. Install new O-rings into cylinder head.



Rockshaft Piston Rings

4. Install cylinder head into cylinder bore. Retain with two lower cap screws. Tighten cap screws to specification.

Specification

Cap Screw—Torque..... 80 N·m (60 lb.-ft.)

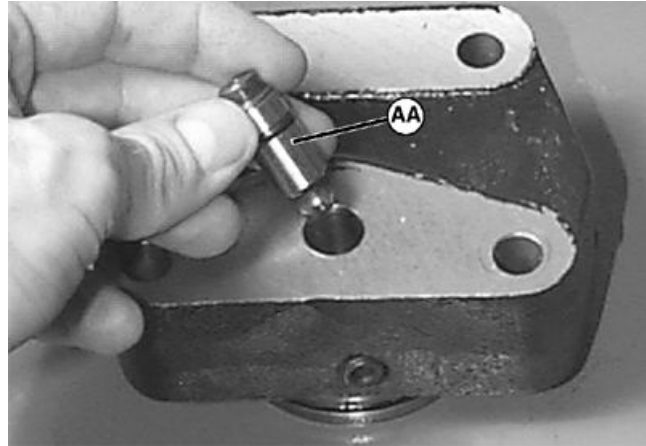
OUO1082,00030CB -19-22FEB12-19/33

LVAL12520 —UN—04NOV10

5. Install a new O-ring onto rate of drop/stop valve spool (AA). Install rate of drop/stop valve spool into bore in cylinder head.

6. Install a new O-ring into end of rate of drop/stop valve stem. Install rate of drop/stop valve stem onto cylinder head and retain with two cap screws.

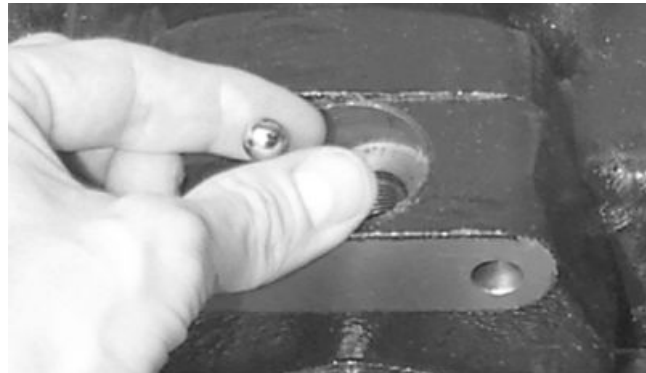
AA—Drop/Stop Valve Spool



OUO1082,00030CB -19-22FEB12-20/33

LVAL12521 —UN—04NOV10

7. Install ball.



Check Valve Ball

Continued on next page

OUO1082,00030CB -19-22FEB12-21/33

LVAL12522 —UN—04NOV10

8. Install plug and spring.



Check Valve Plug and Spring

LVAL12523—UN—04NOV10

OUO1082,00030CB -19-22FEB12-22/33

9. Install two new O-rings in relief valve.



O-rings on Relief Valve

LVAL12524—UN—04NOV10

OUO1082,00030CB -19-22FEB12-23/33

10. Install plastic cap (Y) on top of cylinder head.

11. Install relief valve (X). Tighten to specification.

Specification

Relief Valve—Torque..... 50 N·m (37 lb.-ft.)

X—Relief Valve

Y—Plastic Cap



LVAL12525—UN—04NOV10

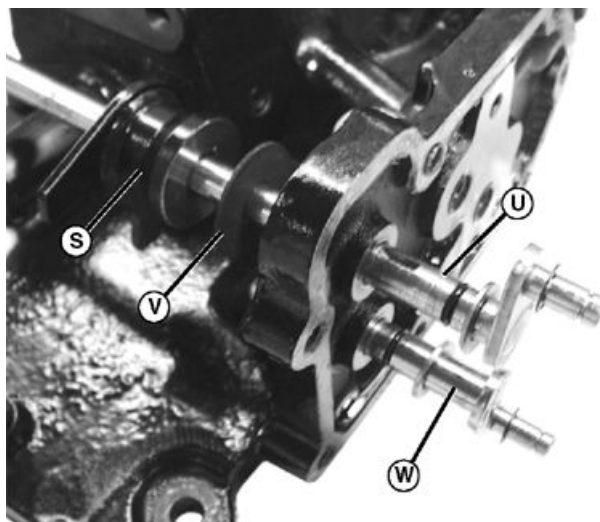
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OUO1082,00030CB -19-22FEB12-24/33

12. If removed, install washers onto lift control (U) and position feedback (W) shafts.
13. If removed, install snap rings onto lift control and position feedback shafts.
14. Install new O-rings onto lift control and position feedback shafts.
15. Install lift control shaft into rockshaft housing. Install rubber washer (V) and limiter (S) onto shaft.
16. Install position feedback shaft into housing.

S—Limiter
U—Control Shaft

V—Rubber Washer
W—Feedback Shaft



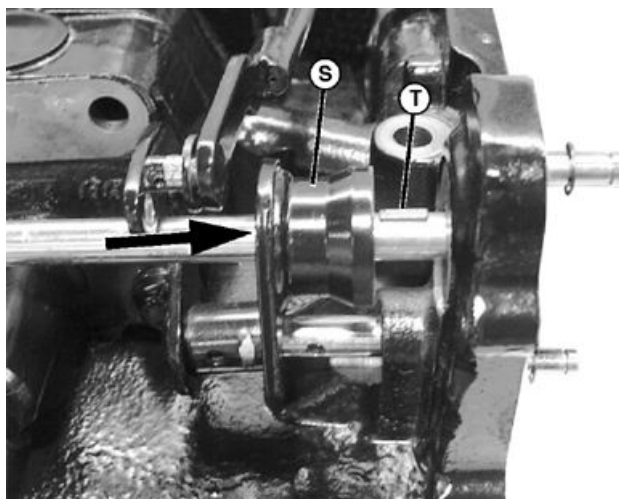
LVAL12526 —UN—04NOV10

OUO1082,00030CB -19-22FEB12-25/33

17. Install woodruff key (T) into shaft. Slide limiter (S) over woodruff key and against rockshaft housing.

S—Limiter

T—Woodruff Key



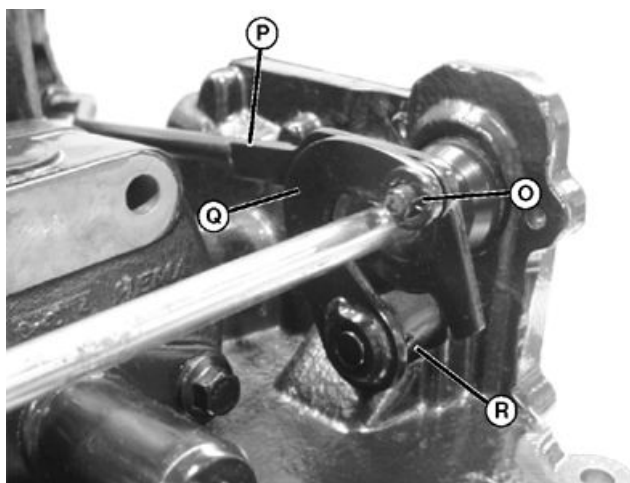
LVAL12527 —UN—04NOV10

OUO1082,00030CB -19-22FEB12-26/33

18. Install feedback lever (Q) onto feedback shaft. Retain with spring pin (R).
19. Connect position feedback rod (P) to position feedback lever. Retain with washer and cotter pin (O).

O—Cotter Pin
P—Feedback Rod

Q—Feedback Lever
R—Spring Pin



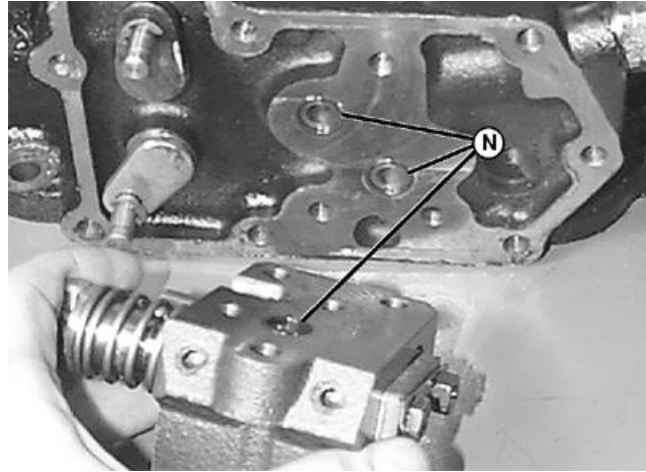
LVAL12528 —UN—04NOV10

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OUO1082,00030CB -19-22FEB12-27/33

20. Install new O-rings (N) into rockshaft control valve and rockshaft housing at rockshaft valve mounting surface.

N—O-ring (3 used)



LVAL12529—UN—04NOV10

OOU1082,00030CB -19-22FEB12-28/33

21. Install rockshaft control valve and retain with three socket head cap screws (M). Tighten cap screws to specification.

Specification

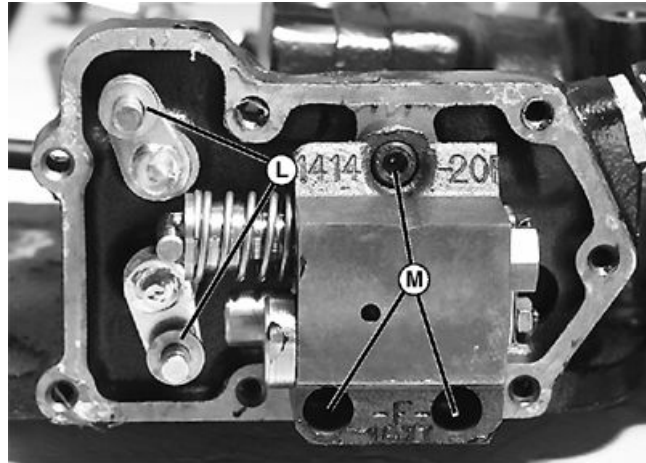
Socket Head Cap

Screw—Torque..... 39 N·m (29 lb.-ft.)

22. Install two washers (L).

L—Washer (2 used)

M—Socket Head Cap Screw (3 used)



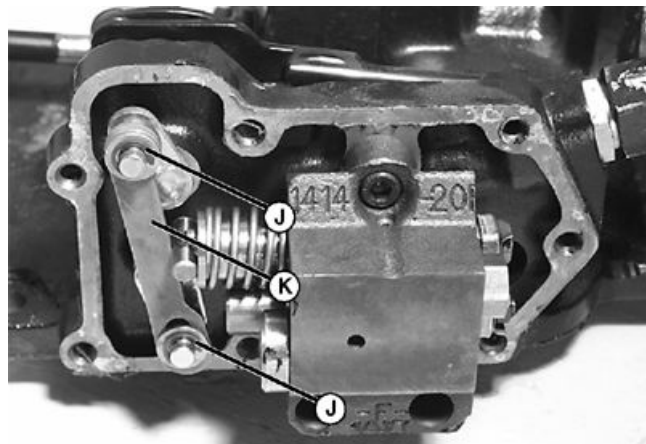
LVAL12530—UN—04NOV10

OOU1082,00030CB -19-22FEB12-29/33

23. Install link (K). Retain with two flat washers and two snap rings (J).

J—Snap Ring (2 used)

K—Link



LVAL12531—UN—04NOV10

Continued on next page

OOU1082,00030CB -19-22FEB12-30/33

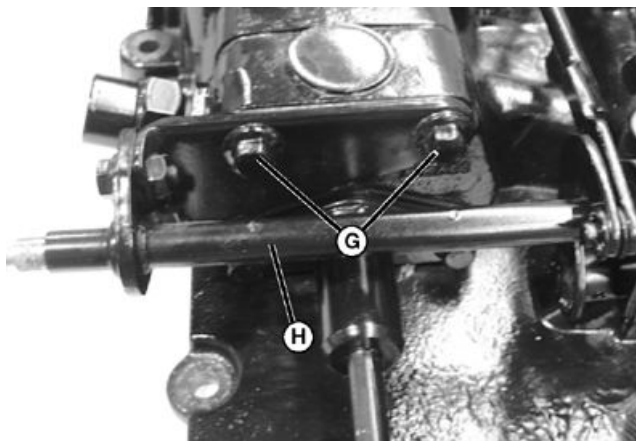
24. Install shaft support tube (H) assembly onto lift control shaft and retain with two cap screws (G). Tighten cap screws to specification.

Specification

Cap Screw—Torque..... 80 N·m (60 lb.-ft.)

G—Cap Screw (2 used)

H—Shaft Support Tube



LVAL12532—UN—04NOV10

OUC1082,00030CB -19-22FEB12-31/33

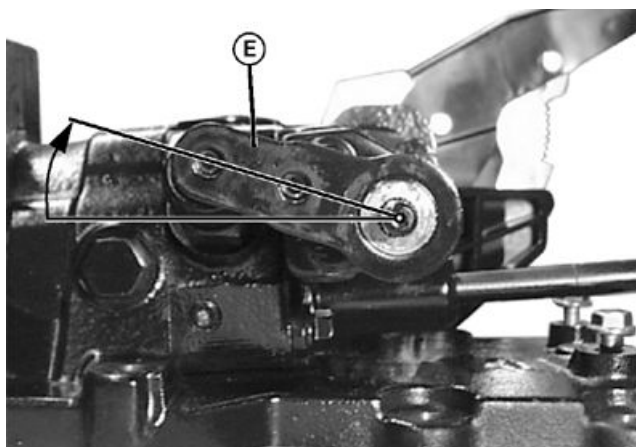
IMPORTANT: Avoid Damage! Make sure that Belleville washers are correctly installed with cupped sides of each pair of washers facing each other.

25. Install washer, two Belleville washers, and lever arm (E) to shaft.

NOTE: Lever arm should be installed so that when the lever arm (E) is fully rotated up, the lever arm is one spline above parallel to the ground.

26. Retain with lever arm (E) lock nut.

E—Lever Arm



LVAL12533—UN—04NOV10

OUC1082,00030CB -19-22FEB12-32/33

27. Install control lever (A) to lever arm (E). Retain with two cap screws (B).

A—Control Lever

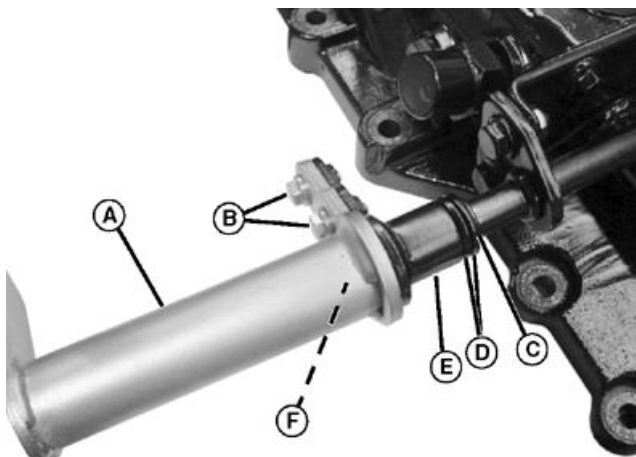
B—Cap Screw (2 used)

C—Flat Washer

D—Belleville Washer (2 used)

E—Lever Arm

F—Lock Nut



LVAL12534—UN—04NOV10

OUC1082,00030CB -19-22FEB12-33/33

Rockshaft Lift Arms Removal and Installation

Removing:

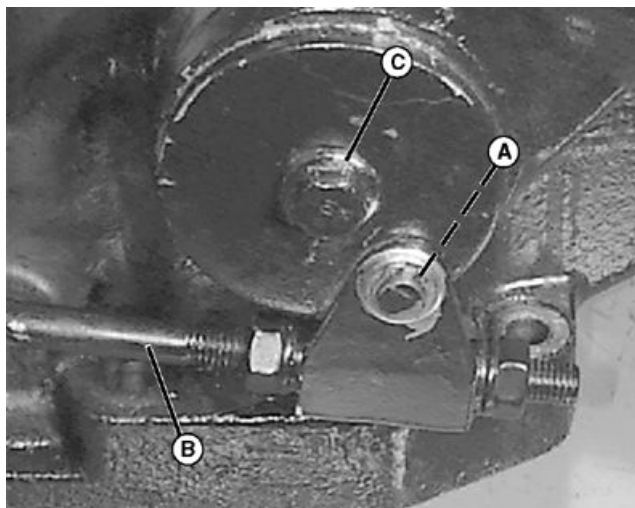
NOTE: Lift arms may be removed with rockshaft assembly installed in machine. **DO NOT** remove splined cross-shaft unless rockshaft is first removed from machine. Internal components will fall into transmission if splined cross-shaft is removed while rockshaft is attached to transmission.

1. Remove snap ring (A) and washer from end of cam plate pin. Disconnect position feedback rod (B).
2. Remove cap screw (C) from end of rockshaft.

A—Snap Ring

B—Position Feedback Rod

C—Cap Screw



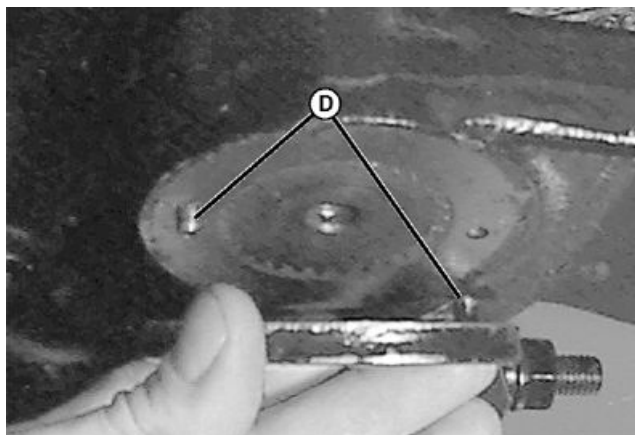
LVAL12535—UN—04NOV10

OUC1082,00030CC -19-22FEB12-1/13

NOTE: Two spring pins (D) retain cam plate to rockshaft.

3. Remove cam plate.

D—Spring Pin (2 used)

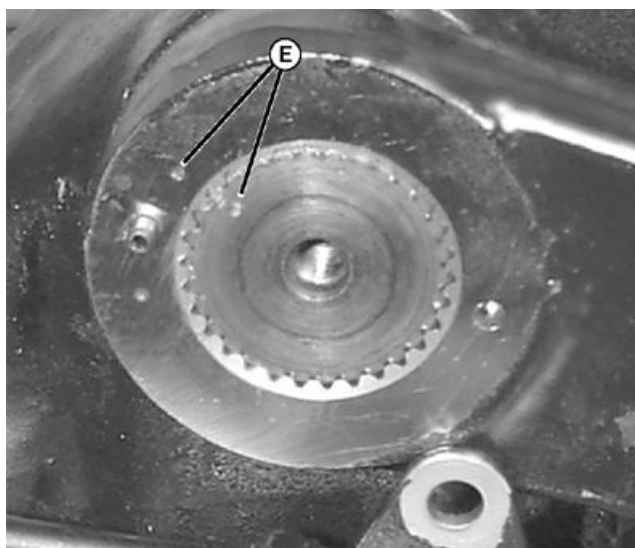


LVAL12536—UN—04NOV10

OUC1082,00030CC -19-22FEB12-2/13

4. If not already done, use center punch to mark (E) splined cross-shaft and lift arm.
5. Remove lift arm from splined cross-shaft.

E—Center Punch Mark (2 used)



LVAL12537—UN—04NOV10

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OUC1082,00030CC -19-22FEB12-3/13

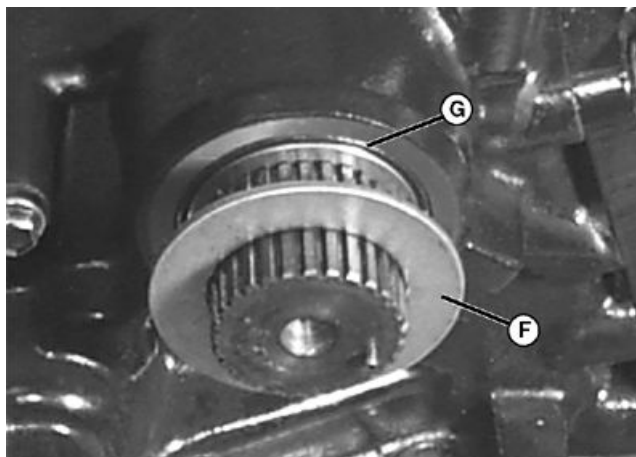
6. Remove washer (F) from splined cross-shaft.
7. Remove outer O-ring (G) from groove in housing.

NOTE: DO NOT remove splined cross-shaft unless rockshaft is first removed from vehicle. Internal components will fall into transmission if splined cross-shaft is removed while rockshaft is on transmission. If rockshaft assembly is still installed on transmission, remove right lift arm only.

8. Remove right side lift arm and splined cross-shaft from housing as a unit.

F—Washer

G—O-ring

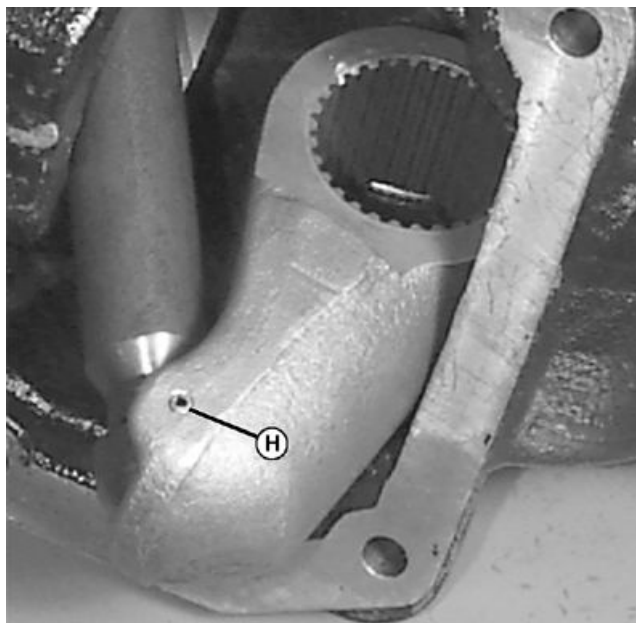


LVAL12538—UN—04NOV10

OUO1082,00030CC -19-22FEB12-4/13

9. If necessary, remove spring pin (H) and separate rockshaft lever arm and piston rod. Remove lever arm and piston rod from rockshaft housing.

H—Spring Pin



LVAL12539—UN—08NOV10

Continued on next page

OUO1082,00030CC -19-22FEB12-5/13

NOTE: Inner O-ring may come out of bore with splined sleeve when removed.

10. Remove two splined sleeves (I) from housing.

NOTE: Beveled ends of the splined sleeves should face inward. There is an O-ring in ID of beveled end of splined sleeve.

11. Remove inner O-ring (J) from bore of rockshaft housing.
12. Remove O-rings (K) from bevelled end of splined sleeves.
13. Inspect splines on ID of splined sleeves for damage. Inspect OD for grooves or excessive wear. Replace as required.
14. Measure OD of splined sleeves. If not to specification, replace.

Specification

Splined Sleeve—OD
(Minimum)..... 46.5 mm (1.832 in.)

15. Measure ID of bushing (L) in housing. If not to specification, replace.

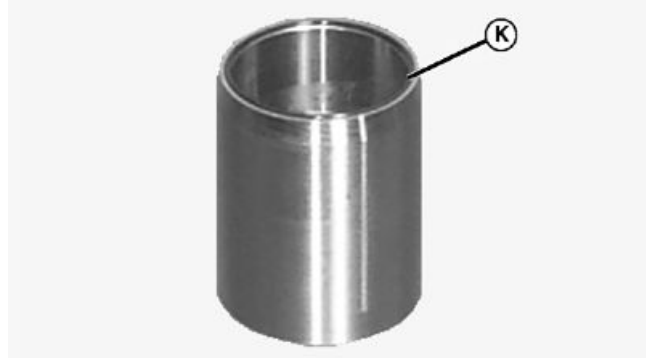
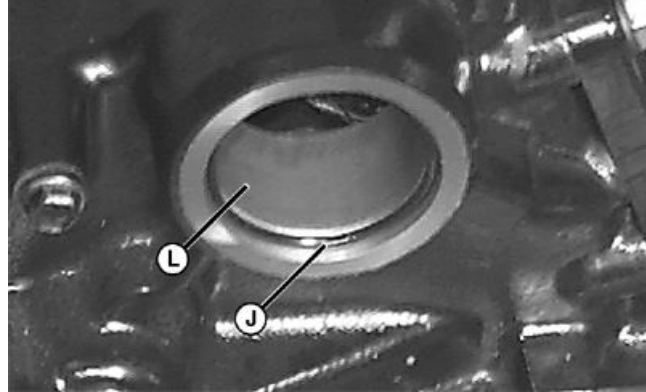
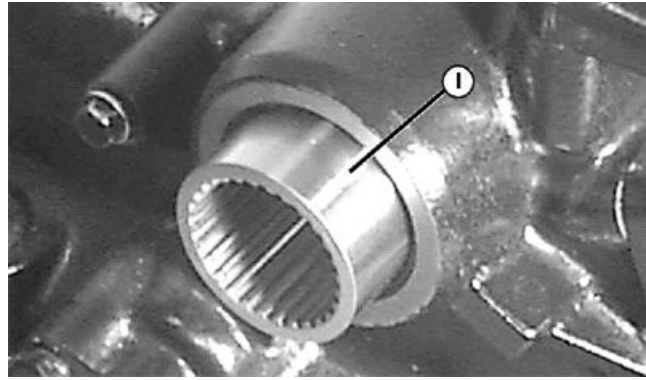
Specification

Bushing—ID
(Maximum)..... 44.2 mm (1.738 in.)

Installing:

IMPORTANT: Avoid Damage! Replace all O-rings and seals. Used or damaged O-rings and seals will leak.

1. If necessary, use a piloted bushing driver to install new bushings (L) into rockshaft housing.
2. Install two new inner O-rings (J) into rockshaft housing against bushings.
3. Install new O-rings (K) into bevelled end of two splined sleeves.
4. Install right side splined sleeve into rockshaft housing with bevel to the inside.



I— Splined Sleeve (2 used)
J— O-ring

L— ID of Bushing
K— O-ring (2 used)

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OUO1082,00030CC -19-22FEB12-6/13

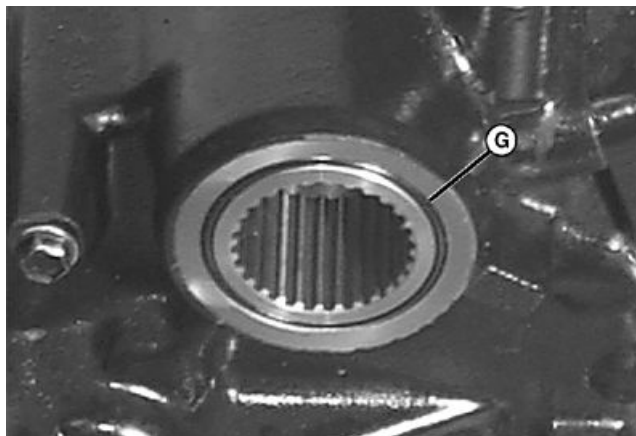
LVAL12540 —UN—08NOV10

LVAL12541 —UN—08NOV10

LVAL12542 —UN—08NOV10

5. Install new outer O-ring (G) into groove between splined sleeve and rockshaft housing.
6. Align punch marks and assemble right side lift arm to splined cross-shaft. Secure with large washer, and cap screw.

G—Outer O-ring



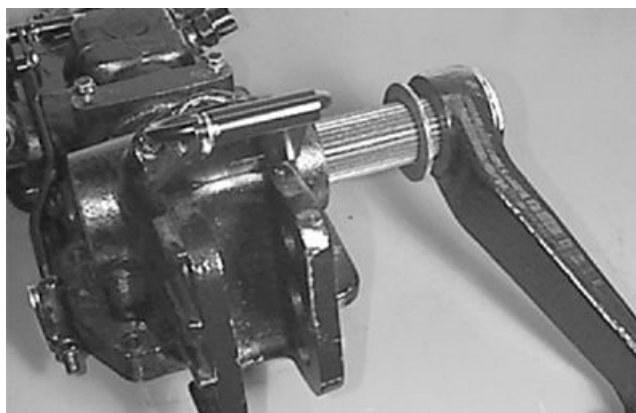
LVAL12543—UN—08NOV10

OUO1082,00030CC -19-22FEB12-7/13

7. Install washer onto rockshaft against right side lift arm.

NOTE: Install shaft carefully to prevent splined cross-shaft from knocking O-ring out of groove in bevelled end of splined sleeve.

8. Install right side lift arm and rockshaft into right splined sleeve in rockshaft housing.



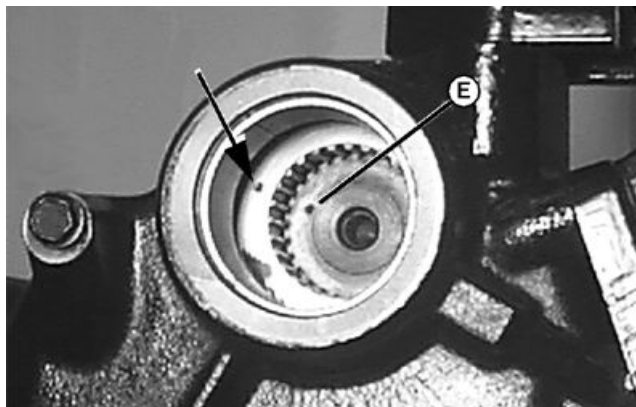
Splined Cross Shaft Installation

LVAL12544—UN—08NOV10

OUO1082,00030CC -19-22FEB12-8/13

9. Align center punch marks (E) on splined cross-shaft and rockshaft lever arm and install cross-shaft through lever arm and into housing.
10. Install left side splined bushing into rockshaft housing and onto splined cross-shaft.

E—Center Punch Mark (2 used)



LVAL12545—UN—08NOV10

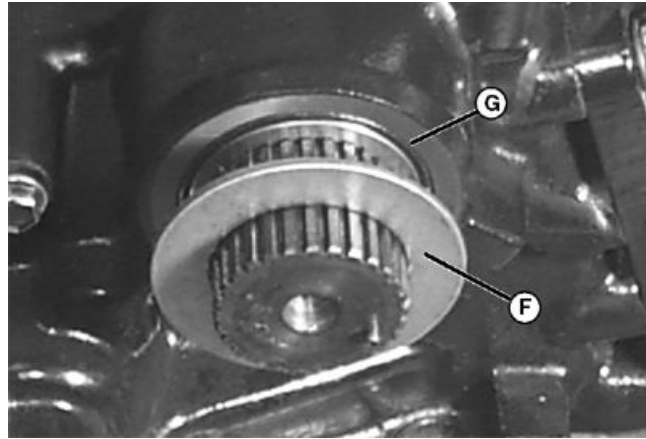
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OUO1082,00030CC -19-22FEB12-9/13

11. Install outer O-ring (G) into groove between splined sleeve and rockshaft housing.
12. Install washer (F) onto splined cross-shaft.

F—Washer

G—O-ring

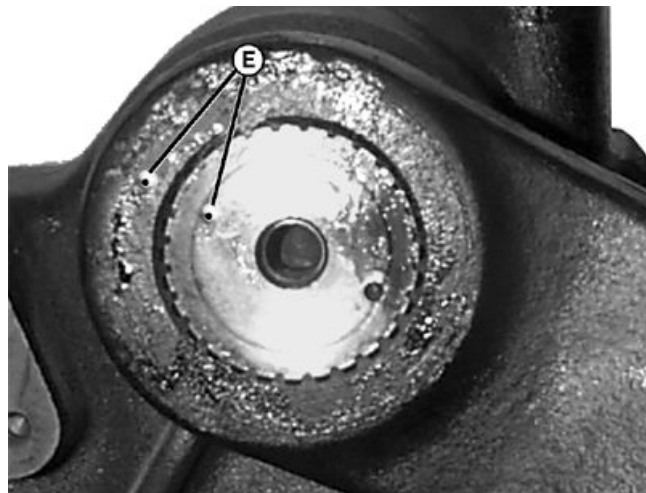


LVAL12546—UN—08NOV10

OUO1082,00030CC -19-22FEB12-10/13

13. Align punch marks (E) on lift arm and splined cross-shaft, and install left side lift arm onto shaft.

E—Center Punch Mark (2 used)

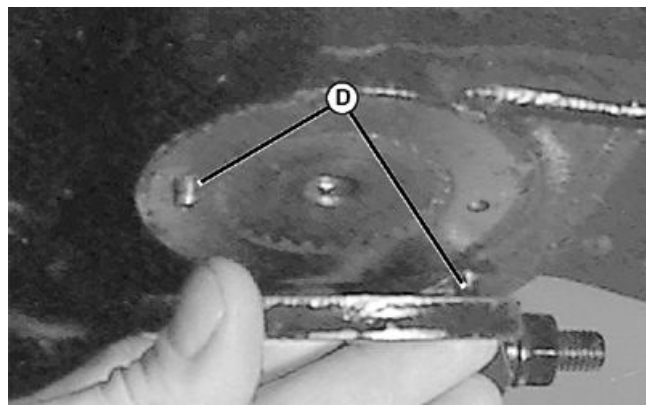


LVAL12547—UN—08NOV10

OUO1082,00030CC -19-22FEB12-11/13

14. Replace spring pins (D) in lift arm or cam plate if damaged.

D—Spring Pin (2 used)



LVAL12548—UN—08NOV10

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OUO1082,00030CC -19-22FEB12-12/13

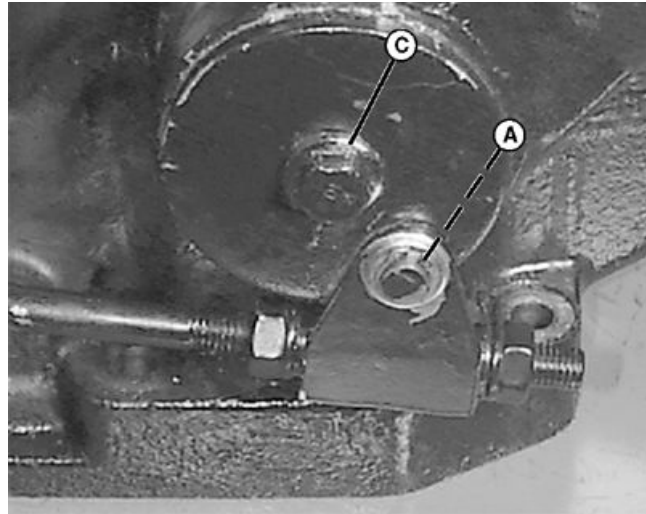
15. Install cam plate. Apply thread lock and retain with cap screw (C).

NOTE: Whenever the rockshaft feedback mechanism has been disturbed, be sure to adjust Rockshaft Position Feedback Linkage. (See Rockshaft Position Feedback Linkage Adjustment in Section 90, Group 30.)

16. Attach position feedback rod and retain with washer and snap ring (A). Adjust to specification.

Specification

Lift Arm Raise—Angle (Above Horizontal).....	50°
Lift Arm Lower—Angle (Below Horizontal).....	20°
Total Lift Arm Range—Angle.....	70°
Variance Between Lift Arms—Angle (Maximum).....	5°



A—Snap Ring

C—Cap Screw

OUO1082,00030CC -19-22FEB12-13/13

LVAL12549 —UN—08NOV10

Selective Control Valve (SCV) (SN —710000)

NOTE: Machine may be equipped with a manifold block on top of PTO valve. Removal and installation of this block is basically the same as that of the SCV.

Removal:

1. Remove five cap screws and right panel from SCV control lever.
2. Remove “J” tube (A) from SCV to rockshaft housing.

NOTE: Power Beyond Kit may be installed on machine. It will be in the place of the “J” tube.

A—“J” Tube

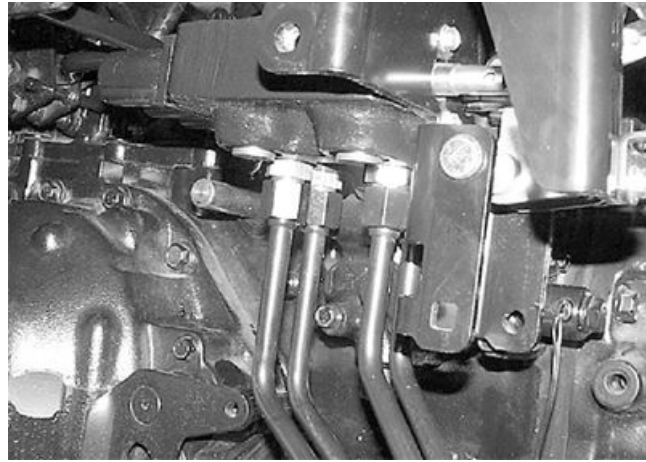


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OUO1082,00030D0 -19-18DEC12-1/19

LVAL18628 —UN—12MAY11

3. Disconnect hydraulic tubes from bottom of SCV.



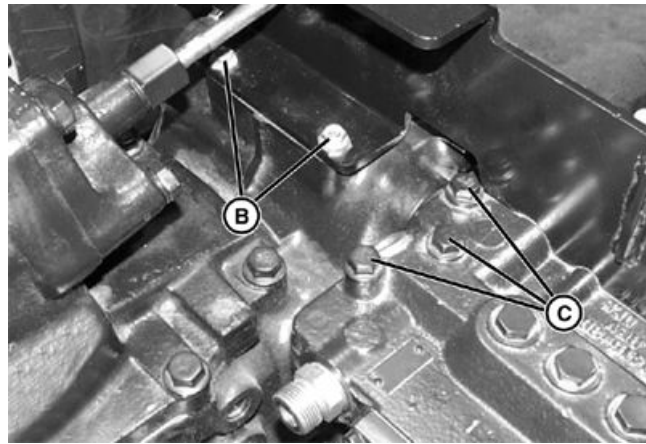
LVAL18629 —UN—12MAY11

OUO1082,00030D0 -19-18DEC12-2/19

4. Remove two cap screws (B) securing seat support bracket to tunnel.
5. Remove three cap screws (C) securing SCV to PTO clutch valve.
6. Remove SCV and seat support as an assembly.

B—Cap Screw (2 used)

C—Cap Screw (3 used)



LVAL18630 —UN—12MAY11

OUO1082,00030D0 -19-18DEC12-3/19

7. Replace two O-rings (D) between PTO clutch valve and SCV.

Installation:

IMPORTANT: Avoid Damage! Replace all O-rings and seals. Used or damaged O-rings and seals will leak.

Installation is the reverse of removal.

- Tighten J-tube ends to specification.

Specification

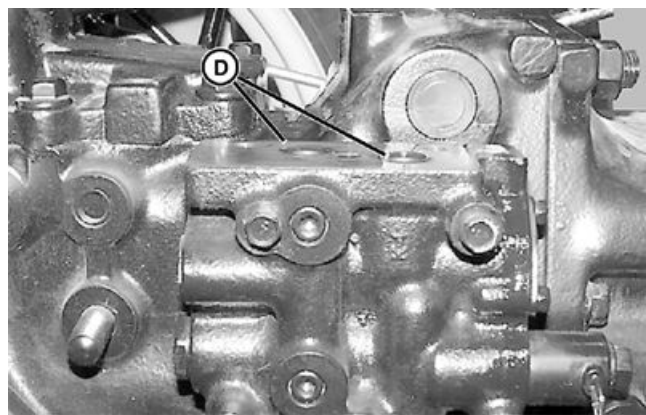
J-Tube Ends—Torque..... 81—89 N·m (60—67 lb.-ft.)

- Tighten SCV work port tube ends to specification.

Specification

SCV Work Port Tube

Ends—Torque..... 51—57 N·m (38—42 lb.-ft.)



D—O-Ring (2 used)

LVAL18631 —UN—12MAY11

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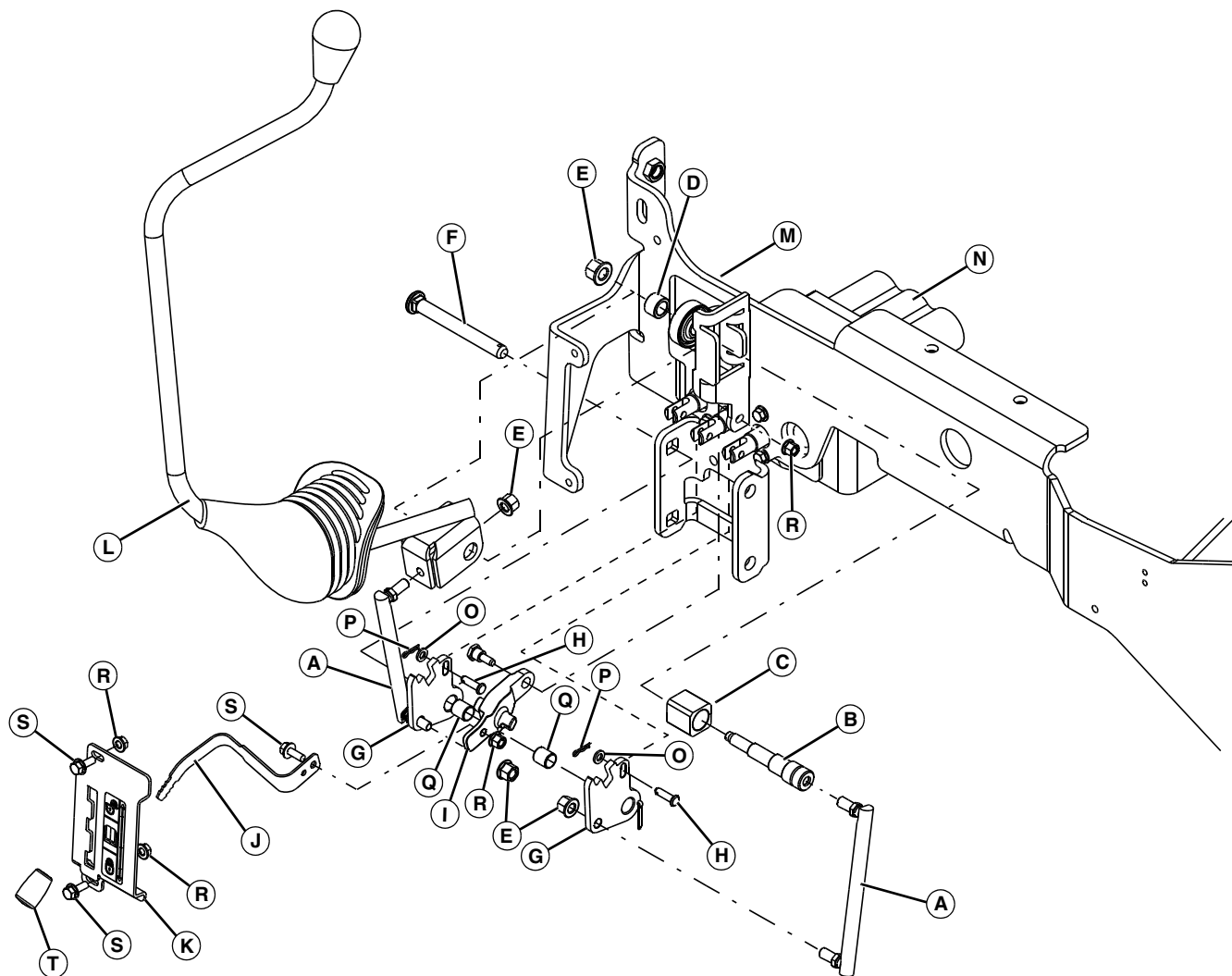
OUO1082,00030D0 -19-18DEC12-4/19

Dual SCV Linkage Disassembly:

NOTE: Some internal components of SCV are NOT serviceable. If SCV internal components

are excessively worn or damaged, check for availability of kits.

Remove drilled pin closest to machine first.



A—Link Rod (2 used)

B—Pin

C—Guide Bar

D—Spacer

E—Lock Nut (4 used)

F—Drilled Pin (2 used)

G—Bellcranks (2 used)

H—Drilled Pin (2 used)

I—Lock Arm

J—Lock Lever

K—Lock Gate

L—Control Rod with Boot

M—Seat Bracket

N—SCV

O—Washer (2 used)

P—Spring Locking Pin (2 used)

Q—Spacer (2 used)

R—Nut (4 used)

S—Screw (3 used)

T—Lock Lever Knob

1. Remove spring pin and washer from drilled pin (H) securing bellcrank to SCV valve. Remove second spring pin and washer from drilled pin securing second bellcrank to SCV.
2. Remove two lock nuts securing bottom of link rods (A) to bellcranks (G).
3. Remove cotter pin from end of drilled pin (F). Remove pin (F) and bellcranks (G).
4. Remove lock nut and cap screw securing lock lever (J). Remove lever.
5. Remove lock nut and cap screw securing lock arm (I) to seat bracket (M).

6. Secure pin (B) with a flat blade screw driver and remove lock nut (E).
7. Slide pin out of seat bracket (M), spacer (D), control rod (L), and guide bar (C).
8. Remove link rods (A) from control rod (L) and pin (B) as necessary.

Dual SCV Linkage Assembly:

Installation is performed in the reverse order of removal.

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OUO1082,00030D0 -19-18DEC12-5/19

LVAL18632 —UN—12MAY11

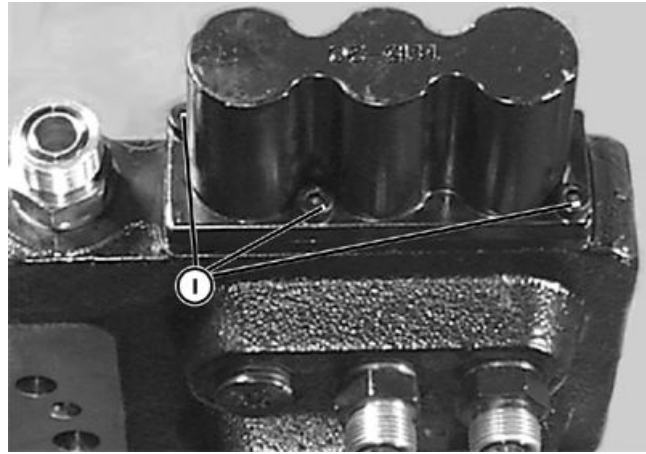
- Apply a heavy duty water resistant grease to the main shifter pivot points.

OUC1082,00030D0 -19-18DEC12-6/19

SCV Disassembly:

1. Remove four socket head cap screws (I) on end cover. Remove end cover. Replace end cover gasket.

I— Socket Head Cap Screw (4 used)



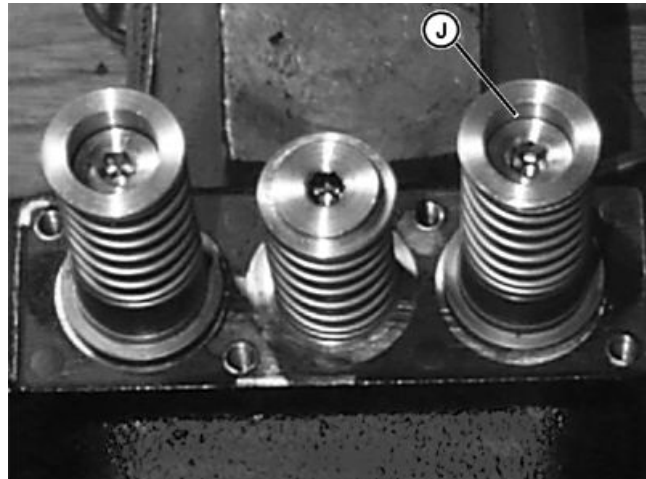
LVAL 18633 —UN—12MAY11

OUC1082,00030D0 -19-18DEC12-7/19

NOTE: Valve spools are similar. Center valve section does NOT contain a detent assembly.

2. Hold spring slightly compressed and remove spring retainer plug (J) and valve spring retainer. Remove spring.

J— Spring Retainer Plug



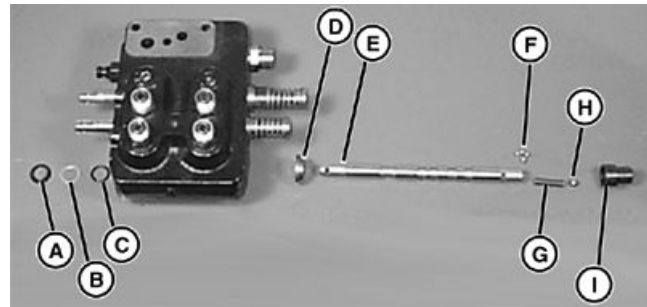
LVAL 18634 —UN—12MAY11

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OUC1082,00030D0 -19-18DEC12-8/19

NOTE: Use care when removing valve spool and detent assembly from valve body. Detent cap may come off, and balls may fall out and be lost. Push valve spool out from lever side to remove.

3. Slide spool with detent assembly out of valve body.
4. Inspect spool and valve body for signs of wear or damage. If worn or damaged, replace entire selective control valve assembly.
5. Remove spacer from spool.
6. Remove seal, backing washer, and O-ring from valve body. Replace O-ring and seal.



A—Seal
B—Washer
C—O-Ring
D—Spacer
E—Spool

F—Small Ball (4 used)
G—Spring
H—Ball
I— Detent Cap

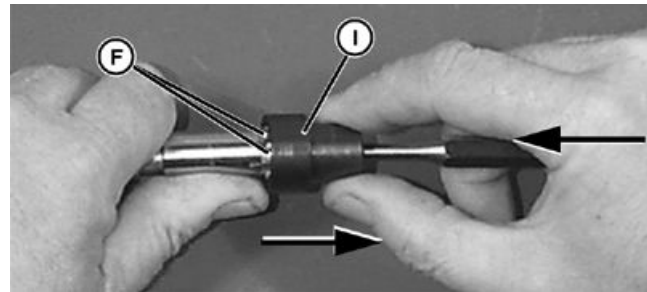
LVAL18635 —UN—12MAY11

OUO1082,00030D0 -19-18DEC12-9/19

7. Remove detent cap (I) by inserting a suitable pin punch into the threaded hole and pressing inward to release spring tension on small balls (F). Slide detent cap off end of spool.

F—Small Ball (4 used)

I— Detent Cap



LVAL18636 —UN—12MAY11

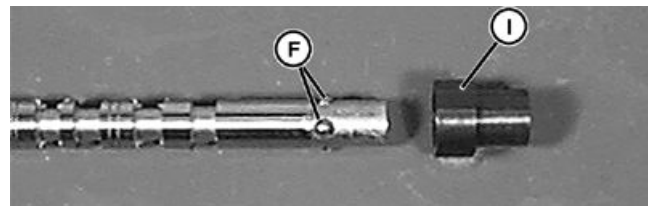
OUO1082,00030D0 -19-18DEC12-10/19

8. Remove detent cap (I).
9. Remove four small balls (F).

F—Small Ball (4 used)

I— Detent Cap

LVAL18637 —UN—12MAY11



OUO1082,00030D0 -19-18DEC12-11/19

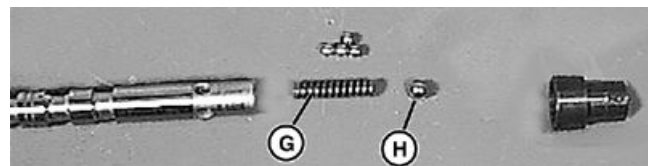
10. Remove larger ball (H), and spring (G).

Valve Spools Assembly:

IMPORTANT: Avoid Damage! Replace all O-rings and seals. Used or damaged O-rings and seals will leak.

1. Install spring and ball into end of valve spool.

LVAL18638 —UN—12MAY11



G—Spring

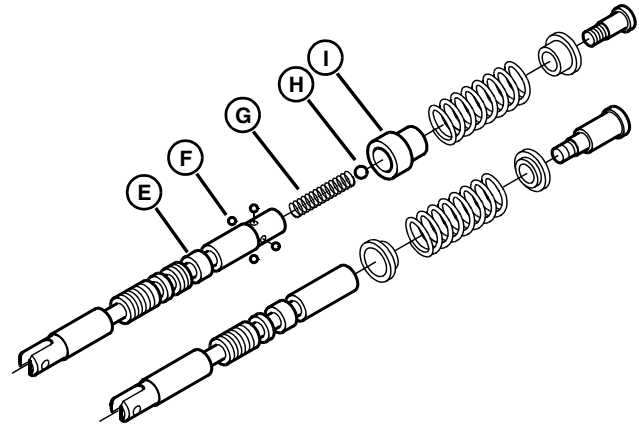
H—Larger Ball

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OUO1082,00030D0 -19-18DEC12-12/19

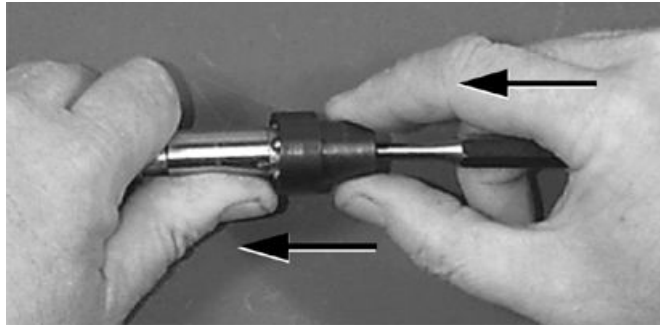
2. Apply a small amount of general purpose grease into the holes for the small balls (F) on the valve spool.
3. Insert four small balls into holes in valve spool.
4. Slide detent cap (I) over end of valve spool. Do not slide over balls at this time.

E—Spool
F—Small Ball (4 used)
G—Spring
H—Ball
I— Detent Cap



LVAL18639 —UN—12MAY11

OOU1082,00030D0 -19-18DEC12-13/19



LVAL18640 —UN—12MAY11

5. Using a suitable pin punch, press on the ball in the end of the spool to slightly compress the spring. Slide detent cap over four small balls.

NOTE: When properly installed, the four small balls will retain the larger ball, and maintain spring pressure on the larger ball.

6. Install spacer onto spool.
7. Slide spool into valve body.
8. Install O-ring, backing washer, and seal into valve body.
9. Install spring, spring retainer, and valve spring retainer plug. Tighten plug to specification.

Specification

Valve Spring Retainer
Plug—Torque..... 15 N·m (11 lb.-ft.)

10. Install end cover. Retain with four socket head cap screws. Tighten cap screws to specification.

Specification

End Cover Socket Head
Cap Screws—Torque..... 19 N·m (14 lb.-ft.)

11. Install lever assembly. Retain with four cap screws. Tighten cap screws to specification.

Specification

Lever Assembly Cap
Screws—Torque..... 40 N·m (30 lb.-ft.)

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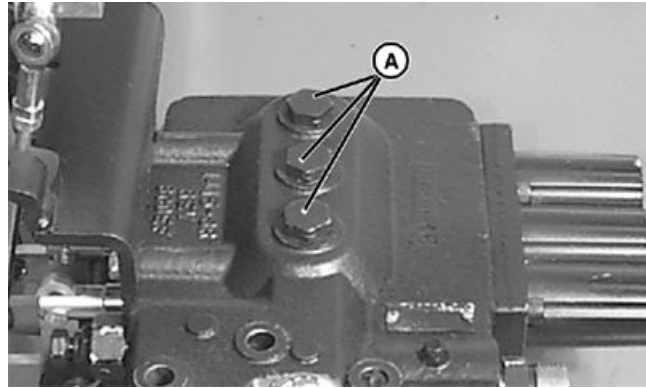
OOU1082,00030D0 -19-18DEC12-14/19

Load Check Valves:

Removal:

1. Remove valves (A).

A—Valve (3 used)



LVAL18641 —UN—12MAY11

OUO1082,00030D0 -19-18DEC12-15/19

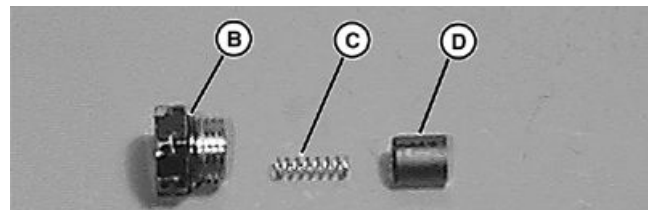
2. Replace O-ring (B).
3. Inspect spring (C) and valve poppet (D) for wear or damage. Replace if necessary.

Installation:

Installation is the reverse of removal.

IMPORTANT: Avoid Damage! Replace all O-rings and seals. Used or damaged O-rings and seals will leak.

LVAL18642 —UN—12MAY11



B—O-Ring
C—Spring

D—Valve Poppet

OUO1082,00030D0 -19-18DEC12-16/19

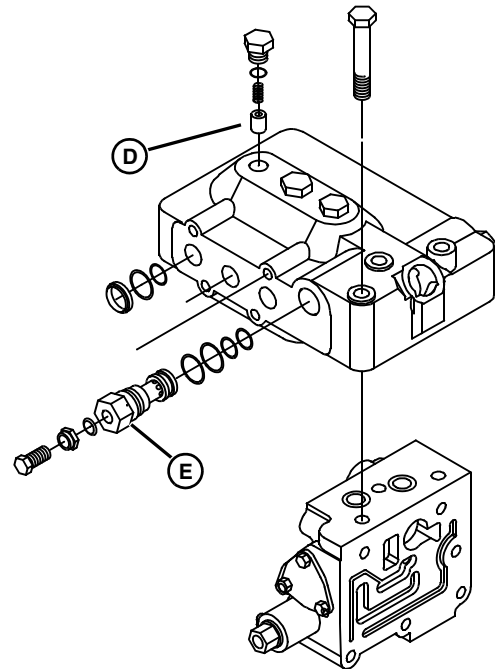
- Tighten check valve to specification.

Specification

Check Valve—Torque..... 24 N·m (18 lb.-ft.)

D—Valve Poppet

E—Valve



LVAL18643 —UN—12MAY11

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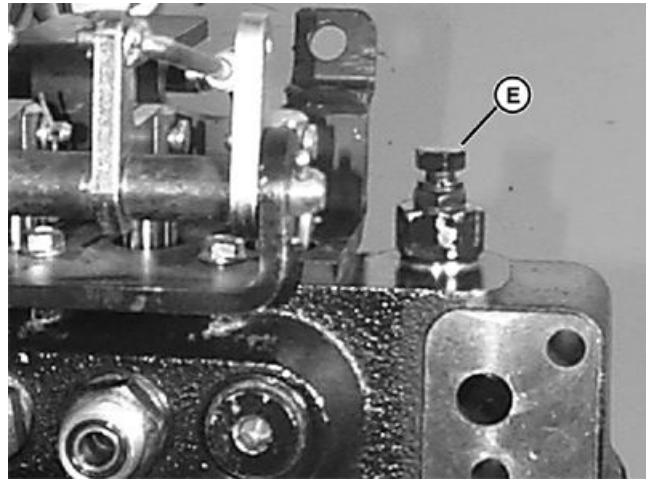
OUO1082,00030D0 -19-18DEC12-17/19

Relief Valve:

Removal:

1. Remove valve (E).

E—Valve



LVAL18644 —UN—12MAY11

OUO1082.00030D0 -19-18DEC12-18/19

2. Replace O-rings (F) and backing washers (G).
3. Inspect valve for wear or damage. Replace if necessary.

Installation:

Installation is the reverse of removal.

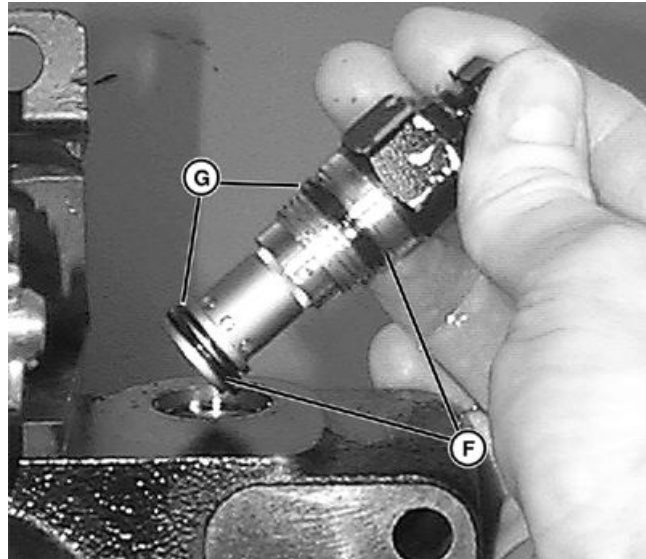
IMPORTANT: Avoid Damage! Replace all O-rings and seals. Used or damaged O-rings and seals will leak.

- Tighten relief valve to specification.

Specification

Relief Valve—Torque..... 50 N·m (37 lb.-ft.)

NOTE: If replacement of relief valve was necessary, or if relief valve setting was changed, perform SCV pressure relief valve adjustment. (See System Pressure/Flow Test in Hydraulics Test and Adjustments.)



LVAL18645 —UN—12MAY11

F—O-Ring (2 used)

G—Backing Washer (2 used)

OUO1082.00030D0 -19-18DEC12-19/19

Selective Control Valve (SCV) (SN 710001—)**Remove:**

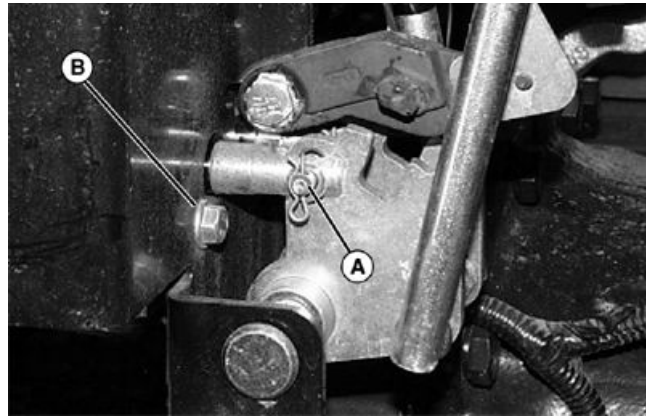
1. Jack up rear of machine and safely support with jackstands. Remove right rear tire/wheel assembly.
2. Remove panels to access selective control valve.
3. Remove knob from SCV lock lever by pulling straight out off of lever. Remove two cap screws and SCV cover.
4. Disconnect all hydraulic work port tubes from bottom of SCV.
5. Disconnect hydraulic lines.
6. Remove two pins (A) (one on each spool) and two cap screws (B) (one on each side of linkage).
7. Remove SCV.

Installation:

IMPORTANT: Avoid Damage! Replace all O-rings and seals. Used or damaged O-rings and seals will leak.

Installation is the reverse of removal.

- Replace O-rings.



A—Pin (2 used)

B—Cap Screw (2 used)

- Tighten SCV to rockshaft tube ends to specification.

Specification

SCV to Rockshaft Tube

Ends—Torque..... 81—89 N·m (60—67 lb.-ft.)

- Tighten SCV work port tube ends to specification.

Specification

SCV Work Port Tube

Ends—Torque..... 51—57 N·m (38—42 lb.-ft.)

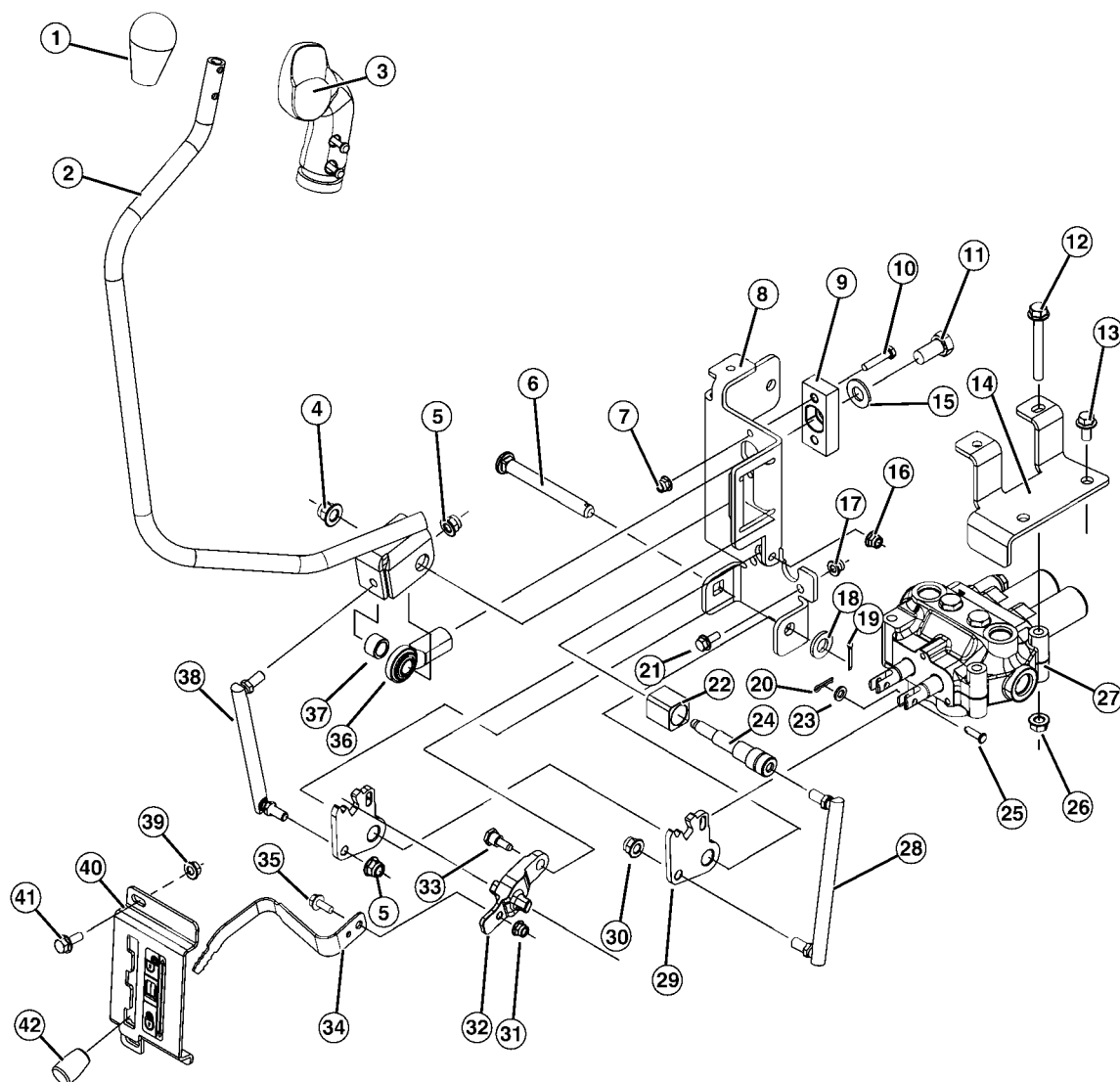
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OUO1082,00030D1 -19-02MAR12-1/3

LVAL18646—UN—12MAY11

SCV Linkage Disassemble: (SN 710001—)

NOTE: Some internal components of SCV are NOT serviceable. If SCV internal components are worn or damaged, check availability of kits.



- | | | | |
|---------------------------------------|-----------------------|-----------------------|------------------|
| 1—Knob (used without 4th and 5th SCV) | 11—Cap Screw | 21—Cap Screw | 34—Lock Lever |
| 2—Lever | 12—Cap Screw (2 used) | 22—Block | 35—Cap Screw |
| 3—Handle (used with 4th and 5th SCV) | 13—Cap Screw (2 used) | 23—Washer | 36—Ball Joint |
| 4—Lock Nut | 14—Bracket | 24—Drilled Pin | 37—Spacer |
| 5—Lock Nut | 15—Washer | 25—Pin | 38—Link |
| 6—Pin | 16—Nut | 26—Nut (2 used) | 39—Nut (2 used) |
| 7—Nut (2 used) | 17—Nut (17 used) | 27—SCV Valve | 40—Cover |
| 8—Bracket | 18—Washer | 28—Link | 41—Bolt (2 used) |
| 9—Block | 19—Cotter Pin | 29—Bellcrank (2 used) | 42—Lock Handle |
| 10—Cap Screw (2 used) | 20—Spring Cotter Pin | 30—Nut | |
| | | 31—Nut | |
| | | 32—Lock | |
| | | 33—Cap Screw | |

1. Remove control lever handle (2) and lock lever handle (42).
2. Remove cotter pin (20), washer (23) and pin (25) connecting each bellcrank to SCV valve spool.
3. Remove cotter pin and washer from pin (6). Remove pin.
4. Remove links (28) from bellcranks, shift lever base and drilled pin.

Continued on next page

OUO1082,00030D1 -19-02MAR12-2/3

LVAL18647—UN—12MAY11

5. Remove nut (4) from drilled pin (24) and remove pin.
6. Remove remaining components.
7. Inspect all parts for wear or damage. Inspect ball joints on links (28) for wear. Inspect wear block (22) and ball joint (36) for wear. Replace any worn or damaged parts.

SCV Linkage Assemble:

Installation is performed in the reverse order of removal.

- Apply a heavy duty water resistant grease to the main shifter pivot points.

OUO1082,00030D1 -19-02MAR12-3/3

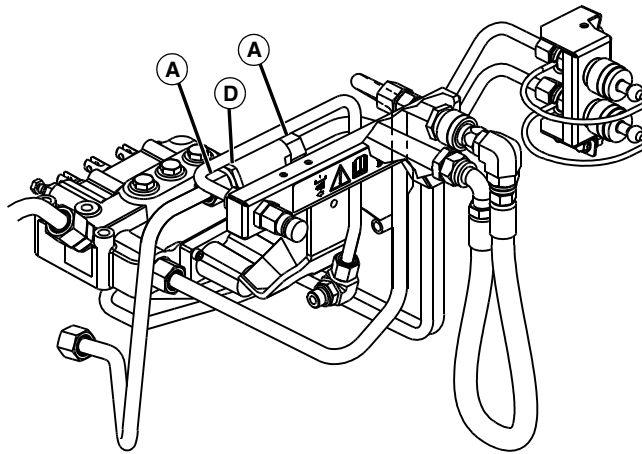
Power Beyond Filter Replacement**Removal:**

NOTE: If changes in the operation of the 3-point hitch lift capacity are detected or the rockshaft control valve should begin to react slowly, erratic or fail to cycle properly; performance of this service procedure may be required.

1. Park machine safely and shut off engine.

CAUTION: Avoid Injury! Before performing this service procedure involving the hydraulic system, the rockshaft must be completely lowered.

2. Lower rockshaft completely to relieve hydraulic pressure from the system.



A—Nut (2 used)

D—Filter Housing

NOTE: Loosening the hydraulic fittings will cause hydraulic oil to leak. Place a rag or container under each fitting to avoid oil spills.

3. Unscrew nuts (A) and remove filter housing (D).

4. Disassemble filter housing. Clean or replace filter as needed.

Continued on next page

OUO1082,00030CE -19-22FEB12-1/2

LVAL12567 —UN—12NOV10

Installation:

IMPORTANT: Avoid Damage! Replace all O-rings and seals. Used or damaged O-rings and seals will leak.

1. Install new O-rings (B) and washer (C).
2. Assemble springs, filter, and housing and tighten housing end to specification.

Specification

Housing End—Torque..... 69 N·m (51 lb.-ft.)

IMPORTANT: Avoid Damage! Install filter housing to hydraulic tubes with the removable end (marked “OUT”) toward the left side (toward rockshaft control valve).

3. Install filter housing to hydraulic lines with removable end (D) to left side.

LVAL12568 —UN—08NOV10



B—O-ring (2 used)
C—Washer

D—Housing End

4. Tighten tube nuts onto filter to specification.

Specification

Tube Nut onto

Filter—Torque..... 28 N·m (21 lb.-ft.)

5. Start machine and cycle rockshaft several times and check for leaks.

OUO1082,00030CE -19-22FEB12-2/2

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Steering

Item	Measurement	Specification
General Specifications:		
Steering Wheel	OD	356 mm (14.0 in.)
Front Steering Inside	Angle (Maximum)	62°
Front Steering Outside	Angle (Maximum)	54°
Steering Wheel—Steering at Maximum Right or Left and Constant Torque Applied to Steering Wheel	Rotation (Maximum)	5 rpm
Toe-In	Position	0—3 mm (0—0.125 in.)
Steering Cylinder (Tie Rod End to Tie Rod End)	Length (Retracted)	522 mm (20.55 in.)

SW03989,0000CBB -19-11NOV10-1/1

Torque Specifications

Item	Measurement	Specification
Torque Specifications:		
Steering Wheel Nut	Torque	39—49 N·m (29—36 lb.-ft.)
Wheel Mounting Bolt	Torque	140 N·m (103 lb.-ft.)
Tilt Steering Column Cap Screw	Torque	40 N·m (30 lb.-ft.)
Hose to Tube Fitting at Cylinder	Torque	37—45 N·m (27—33 lb.-ft.)
Steering Cylinder Hose End	Torque	26—37 N·m (19—27 lb.-ft.)
SCU Hose Ends: Cylinder Tube to Hose at SCU	Torque	22—26 N·m (16—20 lb.-ft.)
Pressure or Return Tube to Hose at SCU	Torque	45—55 N·m (33—41 lb.-ft.)
Steering Cylinder Hose to Adaptor Fitting on SCU	Torque	19—27 N·m (168—240 lb.-in.)
Pressure or Return Hose to Adaptor Fitting on SCU	Torque	40—57 N·m (30—42 lb.-ft.)
SCU to Machine Cap Screw	Torque	30—38 N·m (22—28 lb.-ft.)
Adaptor Fittings to SCU Port	Torque	14—16 N·m (115—150 lb.-in.)
Tie Rod to Spindle Arm Castle Nut (MFWD)	Torque	115—129 N·m (85—95 lb.-ft.)
Tie Rod to Steering Cylinder Rod	Torque	115—129 N·m (85—95 lb.-ft.)
Steering Cylinder Bracket to Front Axle Cap Screw	Torque	115—122 N·m (85—90 lb.-ft.)

SW03989,0000CBC -19-11NOV10-1/1

Specifications

Lubrication Interval

Item	Measurement	Specification
Lubrication Interval		
Tie Rod Ends, Front Axle Pivot Pin	Lubrication (Normal Conditions)	Every 50 hours
Tie Rod Ends, Front Axle Pivot Pin	Lubrication (Dusty Conditions)	Every 10 hours

SW03989,0000CBD -19-11NOV10-1/1

Essential or Recommended Tools

NOTE: Order tools from the SERVICEGARD™ Catalog.

ESSENTIAL TOOLS listed are required to perform the job correctly and are obtainable only from the SERVICEGARD™ Catalog.

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RECOMMENDED TOOLS, as noted, are suggested to perform the job correctly. Some tools may be available from local suppliers or may be fabricated.

SW03989,0000CBE -19-11NOV10-1/4

Adapter Fitting (7/16-20 M 37° X 9/16-18 M ORFS)JT033757 Steering Pressure Test

SW03989,0000CBE -19-11NOV10-2/4

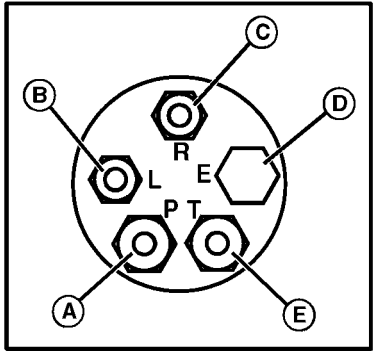
Pressure Gauge 0-14000 kPa (0-2000 psi).....JT0311 Steering Pressure Test

SW03989,0000CBE -19-11NOV10-3/4

Hose with Quick Disconnect FittingJT03017 Steering Pressure Test

SW03989,0000CBE -19-11NOV10-4/4

Steering Components—eHydro™

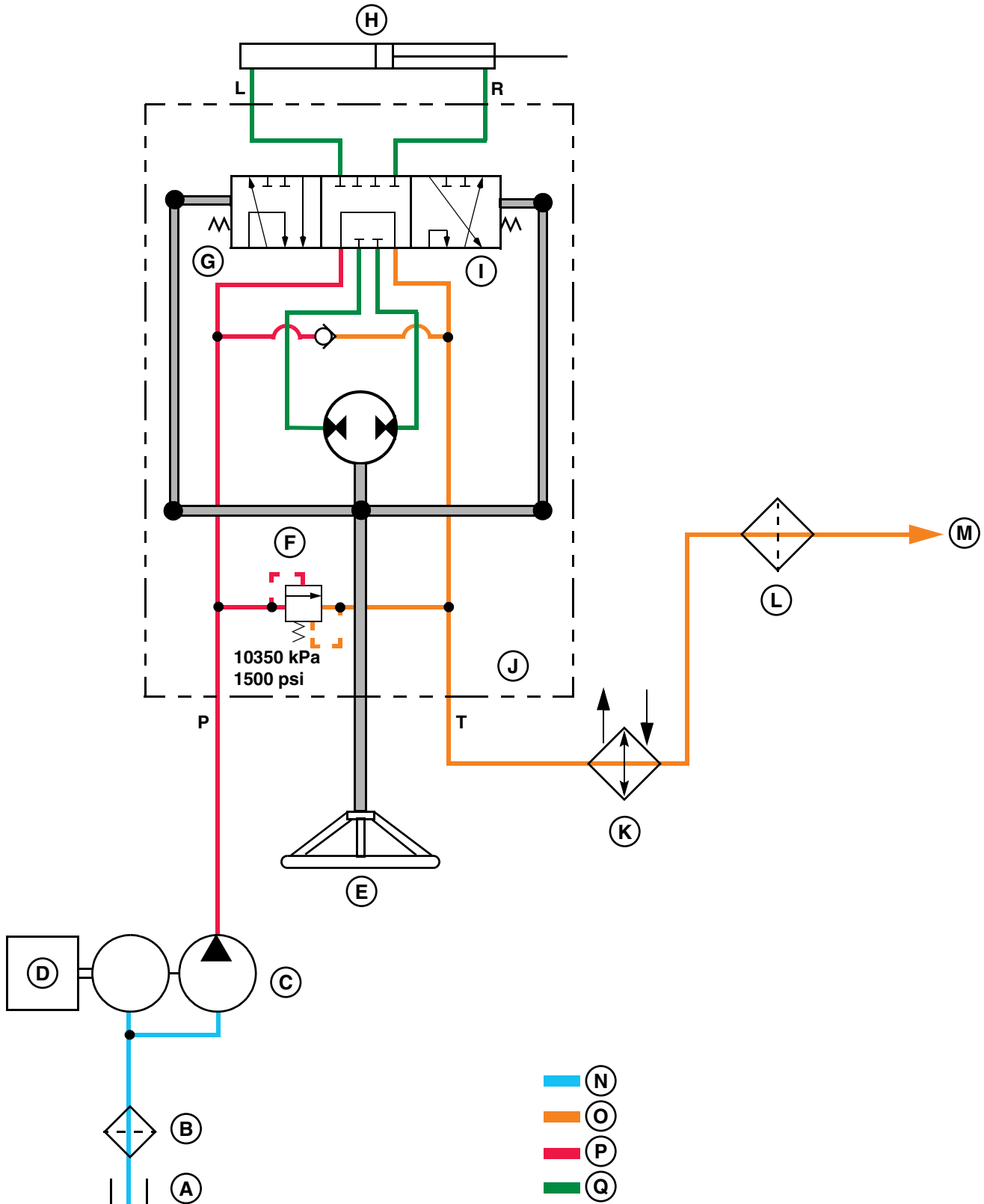


- A—Pressure Hose G—Hydrostatic Transmission K—Left Turn Hose O—Suction Tube Elbow
B—Left Turn Hose H—Cartridge Filter L—Rod End (To Tie Rod) (Reservoir to Pump)
C—Right Turn Hose I— Engine Mounted Hydraulic M—Steering Cylinder
D—Plug Pump N—Hydraulic Oil Cooler (Option)
E—Return Hose (Tank) J— Right Turn Hose

LVAL12569 —UN—12NOV10

SW03989,0000CBF -19-11NOV10-1/1

Steering System Schematic



LVAL12570 —UN—16NOV10

Continued on next page

SW03989,0000CC0 -19-11NOV10-1/2

Component Location

A—Sump	G—Left (Solenoid Valve)	K—Oil Cooler (Option on PRT)	P—High Pressure Oil
B—Intake Filter	H—Steering Cylinder	L— Mesh Filter	Q—Steering Oil
C—Steering Pump (Front)	I— Right (Solenoid Valve)	M—To Transmission	
D—Engine	J— Steering Control Unit	N—Sump Oil	
E—Steering Wheel		O—Charge Pressure/Tunnel	
F—Relief Valve		Lubrication Oil	

SW03989,0000CC0 -19-11NOV10-2/2

All Models

The front hydraulic pump supplies hydraulic pressure to the steering control unit (SCU). The SCU utilizes an open center control valve to operate the steering cylinder. When the steering wheel is turned, the SCU directs

hydraulic pressure to the appropriate steering cylinder hose, pushing the steering cylinder ram, which pivots the front spindles and wheels. The SCU has no relief valve. The SCU and steering cylinder are not re-buildable, and must be replaced as complete units.

SW03989,0000CC1 -19-11NOV10-1/1

eHydro™ Model

Excess oil from the SCU is sent to the oil cooler, mounted in the front of the machine. After the oil is cooled, it passes through the in-line filter and goes to the hydrostatic unit. The hydrostatic unit is a combination motor and pump,

and operates as a closed-loop. Most of the hydraulic oil delivered to this unit passes through the charge pressure relief valve, and returns to the reservoir. A small amount of oil flows through the hydrostatic unit, providing makeup oil, and internal lubrication, then returns to the reservoir.

SW03989,0000CC2 -19-11NOV10-1/1

PowrReverser™ Model

Excess oil from the SCU passes through the cooler (if equipped), through the in-line filter and goes to the PRT clutch control valves.

SW03989,0000CC3 -19-11NOV10-1/1

Steering System Check

Symptom	Problem	Solution
Steering Operation Problems	Wheel bolts loose.	Tighten bolts to specification.
	Tires improperly inflated.	Inflate to proper pressure.
	Tire or rim runout.	Remount tires. Replace tires or rims as necessary
	Wheels do not rotate freely or have rough spots.	Replace bearings.
	Tie rod not straight or castle nuts loose.	Straighten or replace tie rod. Tighten castle nuts to specification. (See Tie Rod Removal and Installation in Section 100, Group 30.)
	Toe-in incorrect.	(See Toe-in Adjustment MFWD in Section 100, Group 30.)
	Steering cylinder not fastened securely or does not operate from stop-to-stop smoothly.	Tighten steering rod fasteners and hose fittings. Replace steering cylinder if it leaks. (See Steering Cylinder Removal and Installation in Section 100, Group 30.)
	Steering wheel installed improperly or the nut not tightened to specification.	(See Steering Wheel Removal and Installation in Section 100, Group 30.)

SW03989,0000CC4 -19-11NOV10-1/1

Steering Operation

Symptom	Problem	Solution
Steering Function Problems	Steering pulls in one direction.	Tire size incorrect, out-of-round, or air pressure incorrect.
		Tie rod ends loose or worn.
		Toe-in incorrect.
		Spindles and/or bearings worn or not lubricated sufficiently.
		Steering cylinder rod (tie rod) bent or damaged.
		Wheel bearing retaining nut loose.
		Wheel bearings worn or lost lubricating properties.
	Steers hard left, right, or both.	Front steering suspension weak or unstable.
		Spindles and/or bearings worn or not lubricated sufficiently.
		Tie rod ends loose or worn.
		Toe-in incorrect.
		Steering cylinder rod (tie rod) bent or damaged.
		Tire size incorrect, out-of-round, or air pressure incorrect.
		Steering wheel and/or shaft splines worn or stripped.
	Steering locks in hard left or right turns.	SCU leaking internally.
		Steering cylinder leaking internally.
		Tie rod ends loose or worn.
		Steering cylinder rod (tie rod) bent or damaged.
		Spindles and/or bearings worn or not lubricated sufficiently.
	Steering wheel pulls upward.	Steering wheel nut loose, stripped, or fallen off.

Continued on next page

SW03989,0000CC5 -19-11NOV10-1/3

Symptom	Problem	Solution
		Steering control unit mounting loose.
	Steering wanders.	Tie rod ends loose or worn.
		Spindles and/or bearings worn or not lubricated sufficiently.
		Steering control unit mounting loose.
		Wheel bearings worn or lost lubricating properties.
		Tire size incorrect, out-of-round, or air pressure incorrect.
		Steering wheel and/or shaft splines worn or stripped.
		Front steering suspension weak or unstable.
		SCU leaking internally.
		Steering cylinder leaking internally
	Steering shimmies or vibrates.	Tie rod ends loose or worn.
		Wheel bearing retaining nut loose.
		Spindles and/or bearings worn or not lubricated sufficiently.
		Wheel bearings worn or lost lubricating properties.
		Tire size incorrect, out-of-round, or air pressure incorrect.
		Front steering suspension weak or unstable.
	Front wheels "plow" loose soil to sides.	Toe-in incorrect.
	Steering wheel spins freely.	Steering wheel and/or shaft splines worn or stripped.
		Steering wheel nut loose, stripped, or fallen off.
		Steering control unit mounting loose.

Continued on next page

SW03989.0000CC5 -19-11NOV10-2/3

Symptom	Problem	Solution
	Steering wheel turns, but wheels do not.	Steering cylinder rod (tie rod) bent or damaged. SCU leaking internally. Steering cylinder leaking internally.
	Steering wheel tilt does not lock	Tilt steering locking mechanism worn or damaged.
Symptom	Problem	Solution
Steering Noise	Noise during turns or over rough terrain.	Tie rod ends loose or worn. Spindles and/or bearings worn or not lubricated sufficiently. Steering control unit mounting loose. Front steering suspension weak or unstable. Wheel bearings worn or lost lubricating properties.
	Wheel bearing noise.	Spindles and/or bearings worn or not lubricated sufficiently. Wheel bearing retaining nut loose. Wheel bearings worn or lost lubricating properties.

SW03989,0000CC5 -19-11NOV10-3/3

Steering Pressure Check

Reason:

To ensure that steering pump pressure is maintained at correct level for steering without causing damage to the system, and to determine if hydraulic pump is worn.

Equipment:

- JT03375—Adapter Fitting (7/16-20 M 37° X 9/16-18 M ORFS)
- JT03117—0—14000 kPa (0—2000 psi) Pressure Gauge
- JT03017 Hose w/Quick Disconnect Fitting

Procedure:

1. Park machine on a level surface and set park brake.
2. Shift transmission to NEUTRAL.

CAUTION: Avoid Injury! Escaping fluid under pressure can penetrate skin and cause serious injury, including gangrene.

Relieve pressure before disconnecting hydraulic or other pressurized lines.

Use a piece of cardboard to search for leaks. Do not expose hands or body to high-pressure fluids.

Tighten all connections before applying pressure.

3. Cycle all controls to relieve any pressure that may be in the hydraulic system.
4. Remove hydraulic hose on left side of steering cylinder.
5. Attach gauge to left steering hose.

NOTE: Turning steering wheel to the right will cause hydraulic oil to leak out of disconnected cylinder port. Turn wheel only to left when performing test.

6. Start engine and run at fast idle.
7. Turn steering wheel to the left. While turning wheel, check pressure reading on gauge.

Specification

Pressure
Reading—Pressure..... 10342 kPa ± 10% (1500 psi ± 10%)

Results:

- **No pressure:** Steering hoses may be incorrectly connected to the SCU. Check hose connections.
- **Pressure too low:** Relief valve in SCU may be stuck open or defective; perform steering system test (See Steering System Test in Section 100, Group 30.); or gear pump may be worn; disassemble and inspect pump. (See Hydraulic Gear Pump in Section 90, Group 35.)
- **Pressure too high:** Relief valve in SCU may be clogged or defective.

SW03989,0000CC6 -19-05NOV10-1/1

Steering System Test

Reason:

To check steering control unit and steering cylinder operation and check for internal leakage.

Tools:

- Torque wrench
- Caps for hydraulic lines

Procedure:

1. Run the machine until the hydraulic fluid is at operating temperature.
2. Turn the steering wheel to the full right position. Apply constant torque to the steering wheel retaining nut, and count the steering wheel rotations in one minute.

Specification

Constant Torque
to The Steering
Wheel—Torque..... 6.8 N·m (60 lb.-in.)

3. Repeat the procedure turning the steering wheel to the full left position.

4. Stop engine.

Results:

- If the rotation in left or right-hand direction exceeds five rotations in one minute, the steering system has internal leakage. To determine whether it is the SCU or cylinder that is leaking, proceed as follows:

Procedure:

1. Label and remove both left and right hydraulic hoses at the steering cylinder.
2. Cap the ends of both hoses.
3. Repeat the SCU test.

Results:

- If the rotation speed is now below five rotations in one minute, replace the steering cylinder.
- If the rotation speed remains above five rotations in one minute, replace the SCU.

SW03989,0000CC7 -19-05NOV10-1/1

Toe-in Adjustment MFWD

Reason:

To ensure proper wheel tracking when turning, and to prevent tire scrub and premature tire wear.

Tools:

- Wrenches
- Tape Measure
- Tire scribing tool

Procedure:

1. Jack up front axle so tires are off floor.
2. Rotate tire by hand and scribe a line near the center of each of the front tires.
3. Measure and record the distance between the lines at the front and the rear of the tire at about axle height. The front measurement should be less than the rear measurement. (See specification.)

Specification

Front Measure-
ment—Distance..... 0—3 mm (0—0.125 in.)

NOTE:

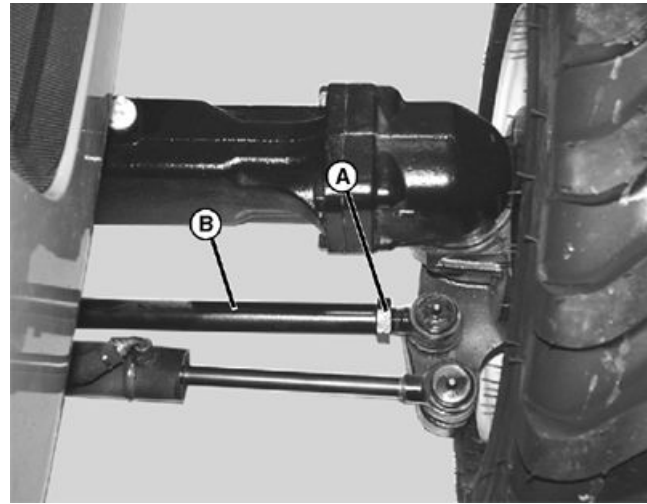
- *If both tie rod ends were removed, screw-in the rod end until the distance from the lock nut to the end of the threads is to specifications (approximately.) Tighten the lock nuts.*

Specification

Tie Rod
Ends—Distance..... 22 mm (0.875 in.)

- *One of the tie rod ends and jam nut has left-hand threads.*

4. If measurement is not correct, loosen jam nuts (A) on both ends of tie rod and turn the tie rod (B) using a wrench to increase or decrease the amount of toe until the measured dimension is within specification.



A—Jam Nut (2 used)

B—Tie Rod

Specification

Toe In—Distance..... 0—3 mm (0—0.125 in.)

5. Tighten the jam nuts.

LVAL12571—UN—04NOV10

SW03989,0000CC8 -19-05NOV10-1/1

Steering Cylinder Removal and Installation

Removal:

1. Mark hoses (A) and disconnect from cylinder.

NOTE: Cylinder ball end studs are tapered. Use a tie rod end removal tool to avoid damaging threads if cylinder is to be re used.

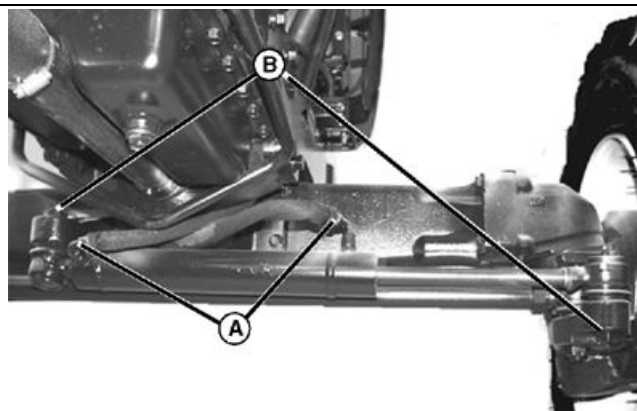
2. Remove cotter pins and castle nuts (B).
3. Remove cylinder.

Installation:

1. Inspect rubber boots on ends of cylinder. Replace boots if necessary.
2. Install cylinder and tighten castle nuts to specification. If slots in castle nut do not line up with cotter pin hole, continue tightening nut until next slot lines up.

Specification

Castle Nut—Torque..... 115—129 N·m (85—95 lb.-ft.)



A—Hose (2 used)

B—Castle Nut (2 used)

3. Connect hoses to cylinder.

Specification

Hose End—Torque..... 26—37 N·m (19—27 lb.-ft.)

SW03989,0000CC9 -19-11NOV10-1/1

LVAL12572 —UN—04NOV10

Steering Wheel Removal and Installation

Removal:

1. Disengage three locking tabs (A) at underside of steering wheel and remove steering wheel center cover.

A—Locking Tab (3 used)



SW03989,0000CCA -19-11NOV10-1/2

LVAL12573 —UN—04NOV10

2. Remove lock nut (B).
3. Remove steering wheel. If necessary, use a suitable puller.

Installation:

NOTE: Lubricate the steering shaft splines with general-purpose grease before installing steering wheel to allow easy removal.

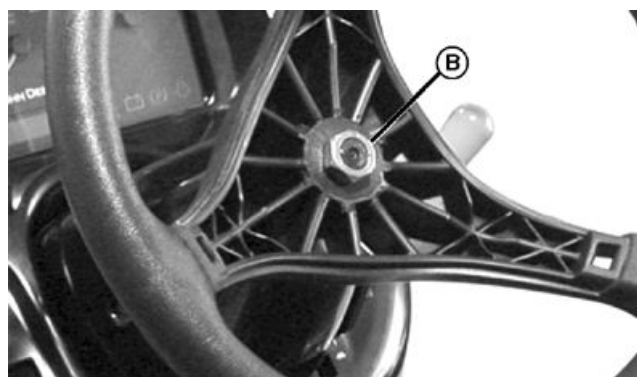
1. Install steering wheel and retain with nut. Tighten steering wheel nut to specification.

Specification

Steering Wheel

Nut—Torque..... 39—49 N·m (29—36 lb.-ft.)

2. Install center cover to steering wheel.



B—Lock Nut

SW03989,0000CCA -19-11NOV10-2/2

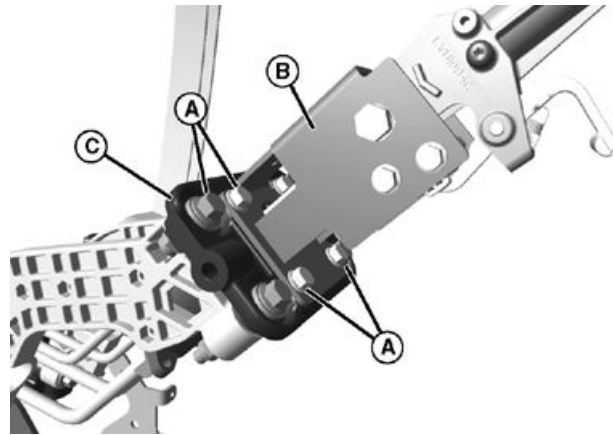
LVAL12574 —UN—04NOV10

Tilt Steering Mechanism Removal and Installation

Removal:

NOTE: The tilt steering mechanism contains no serviceable parts and must be replaced as a complete unit.

1. Remove control panel. (See [Control Panel Removal and Installation](#) in Section 120, Group 10.)
2. Remove four cap screws (A) securing tilt steering column (B) to center support (C) and lift column to remove.



LVAL12575—UN—04NOV10

A—Cap Screw (4 used)
B—Tilt Steering Column

C—Center Support

SW03989,0000CCB -19-11NOV10-1/2

Installation:

1. Install tilt steering column onto center support, aligning steering column shaft (D) with shaft (E) on SCU valve and securing with cap screws removed earlier. Tighten to specifications.

Specification

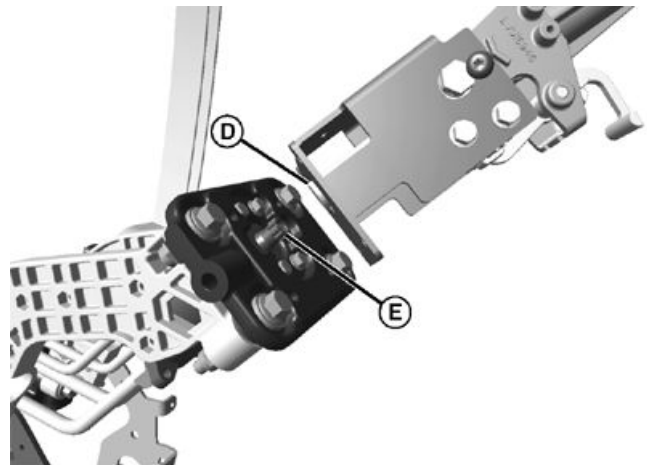
Tilt Steering Column Cap

Screw—Torque..... 40 N·m (30 lb.-ft.)

2. Remainder of installation is the reverse of removal.

D—Steering Column Shaft

E—Shaft



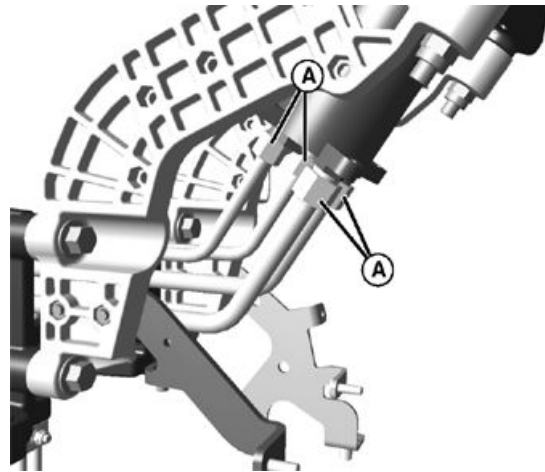
LVAL12576—UN—04NOV10

SW03989,0000CCB -19-11NOV10-2/2

Steering Control Unit (SCU) Removal and Installation

Removal:

1. Remove the steering wheel.
2. Remove the cowl panels. (See [Cowl Panel Removal and Installation](#) in Section 120, Group 10.)
3. Remove the control panel. (See [Control Panel Removal and Installation](#) in Section 120, Group 10.)
4. Remove the tilt steering assembly. (See [Tilt Steering Mechanism Removal and Installation](#) in Section 100, Group 30.)
5. Detach the fuse panel from the mounting bracket and lay it down to gain better access to the hydraulic lines at the base of the SCU. Do not disconnect any harness plugs attached to the fuse panel.
6. Place some clean shop rags around the hydraulic lines under the SCU to absorb hydraulic fluid that may escape when lines are disconnected. Label and remove the four hydraulic lines (A).



A—Hydraulic Line (4 used)

LVAL12577—UN—04NOV10

SW03989,0000CCC -19-11NOV10-1/2

NOTE: The SCU has no serviceable components. If the SCU does not meet specifications, the unit must be replaced.

7. Remove four cap screws (B) and remove the SCU from the machine.

Installation:

1. Check that O-rings are installed on port fittings. Replace any missing or damaged O-rings.

NOTE: Unevenly or improperly torquing cap screws attaching SCU to machine can result in distortion of the valve body, and premature failure of the SCU.

2. Install the SCU to the machine, securing with four cap screws, removed earlier. Tighten to specification.

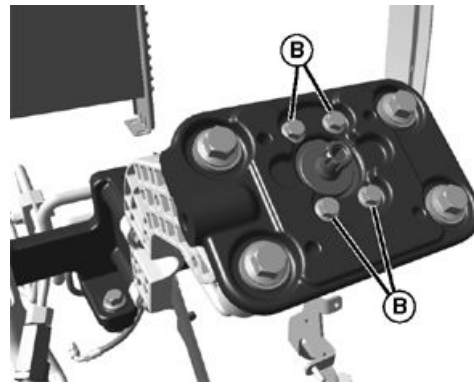
Specification

SCU Mounting Cap	
Screw—Torque.....	30—38 N·m (22—28 lb.-ft.)

3. Install the hydraulic lines to the adapter fittings and tighten to specification.

Specification

SCU Adapter	
Fitting—Torque.....	14—19 N·m (124—168 lb.-in.)
Small Line To	
SCU—Torque.....	19—27 N·m (168—240 lb.-in.)
Large Line To	
SCU—Torque.....	40—57 N·m (30—42 lb.-ft.)



B—Cap Screw (4 used)

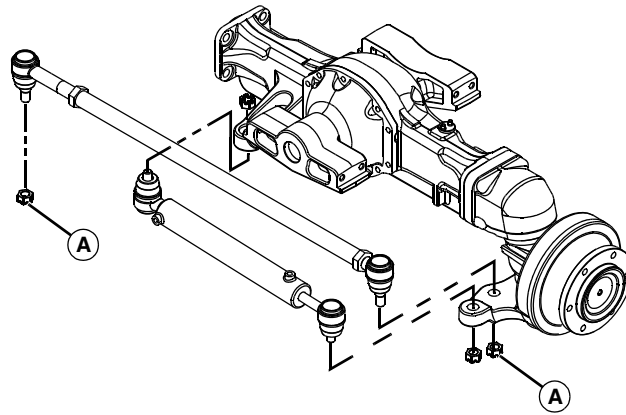
LVAL12578—UN—04NOV10

4. Install the fuse panel.
5. Install the tilt steering column. (See [Tilt Steering Mechanism Removal and Installation](#) in Section 100, Group 30.)
6. Install the cowl panels and control panel. (See [Control Panel Removal and Installation](#) in Section 120, Group 10.)
7. Fill the hydraulic system to the proper level; bleed the system if necessary.

SW03989,0000CCC -19-11NOV10-2/2

Tie Rod Removal and Installation

Removal:



A—Castle Nut (2 used)

1. Remove cotter pins from castle nuts (A) and remove castle nuts.

NOTE: If removing tie rod ends, one of the tie rod ends and jam nut has left-hand threads.

2. Using a tie rod end separator, remove tie rod ends from spindles.

Installation:

1. Inspect tie rod end boots. If necessary, replace boots.
2. Insert tie rod ends into holes in spindle arms.
3. Install two castle nuts to rod ends.

4. Tighten castle nuts (A) to specification.

Specification

Castle Nuts—Torque..... 75—108 N·m (55—80 lb.-ft.)

5. Install the cotter pins. If slots in castle nuts do not align with holes after torquing, tighten nuts until next slot aligns.
6. Lubricate tie rod ends using general-purpose grease. Follow lubrication procedure outlined in the maintenance section of the operator's manual.
7. Adjust toe-in. (See Toe-in Adjustment MFWD in Section 100, Group 25.)

SW03989,0000CCD -19-11NOV10-1/1

LVAL12579 —UN—12NOV10

Section 110 Brakes

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Brakes

Item	Measurement	Specification
Specifications:		
Brake Type	Type	Wet Multiple Disc
Brake Pedal Travel	Distance	60 mm (2-3/8 in.)
Pedal Differential	Distance	2 mm (0.08 in.) or Less
Parking Brake Pull-Up (force required to set)	Force	175—200 N (39—45 lb.) at Eighth Notch

SW03989,0000CCE -19-11NOV10-1/1

Transaxle Oil

Item	Measurement	Specification
Specifications:		
Transaxle Oil	Type	John Deere J20D
PowrReverser™ Machines	Capacity	23.8 L (6.3 gal.)
eHydro™ Machines	Capacity	25.7 L (6.8 gal.)

PowrReverser is a trademark of Deere & Company
eHydro is a trademark of Deere & Company

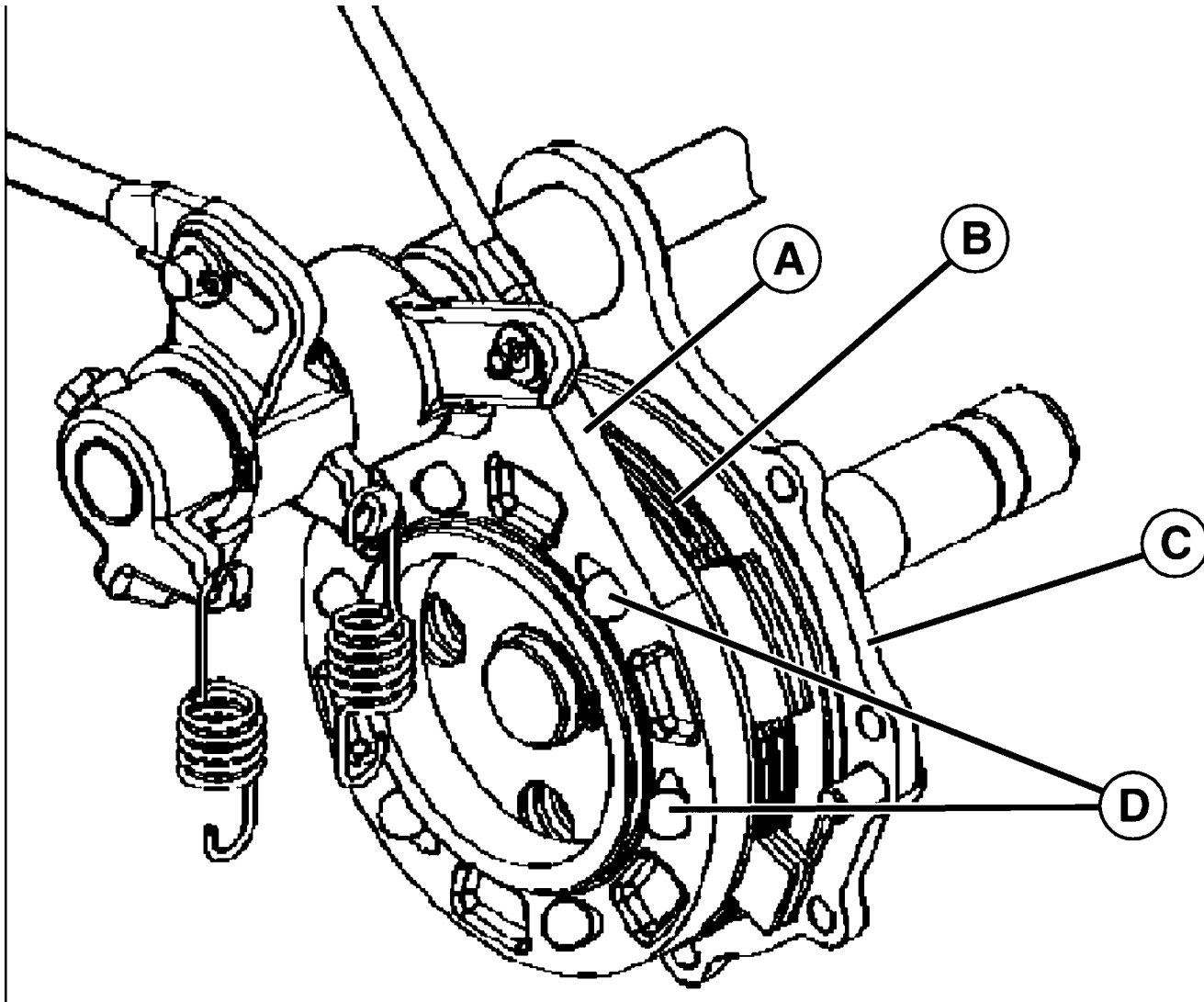
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Torque Specifications

Item	Measurement	Specification
Torque Specifications:		
Rear Wheel Bolts	Torque	140 N·m (103 lb.-ft.)
Brake Assembly Cap Screw	Torque	28 N·m (21 lb.-ft.)

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Brake Housing



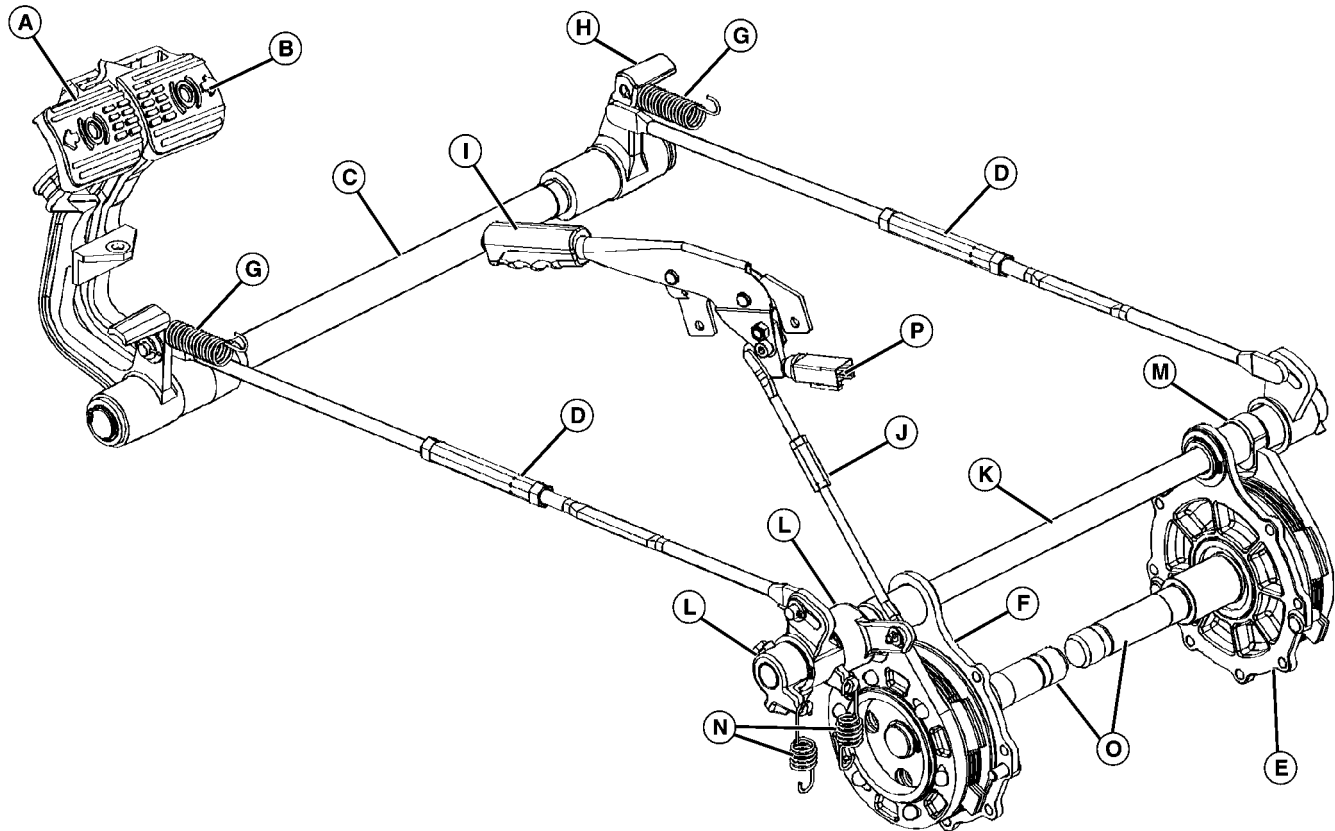
A—Brake Arm and Actuator Plate B—Friction Discs and Plates

C—Brake Cover
D—Steel Balls (6 used)

LVAL12560 —UN—12NOV10

SW03989,0000CD1 -19-05NOV10-1/1

Brake Pedals and Linkage—eHydro™



A—Left Hand Brake Pedal
B—Right Hand Brake Pedal
C—Brake Pedal Cross Shaft
(through clutch housing)

D—Brake Rod (2 used)
E—Right Brake Assembly
F—Left Brake Assembly
G—Brake Pedal Return Springs
H—Brake Switch Lever (if
equipped)

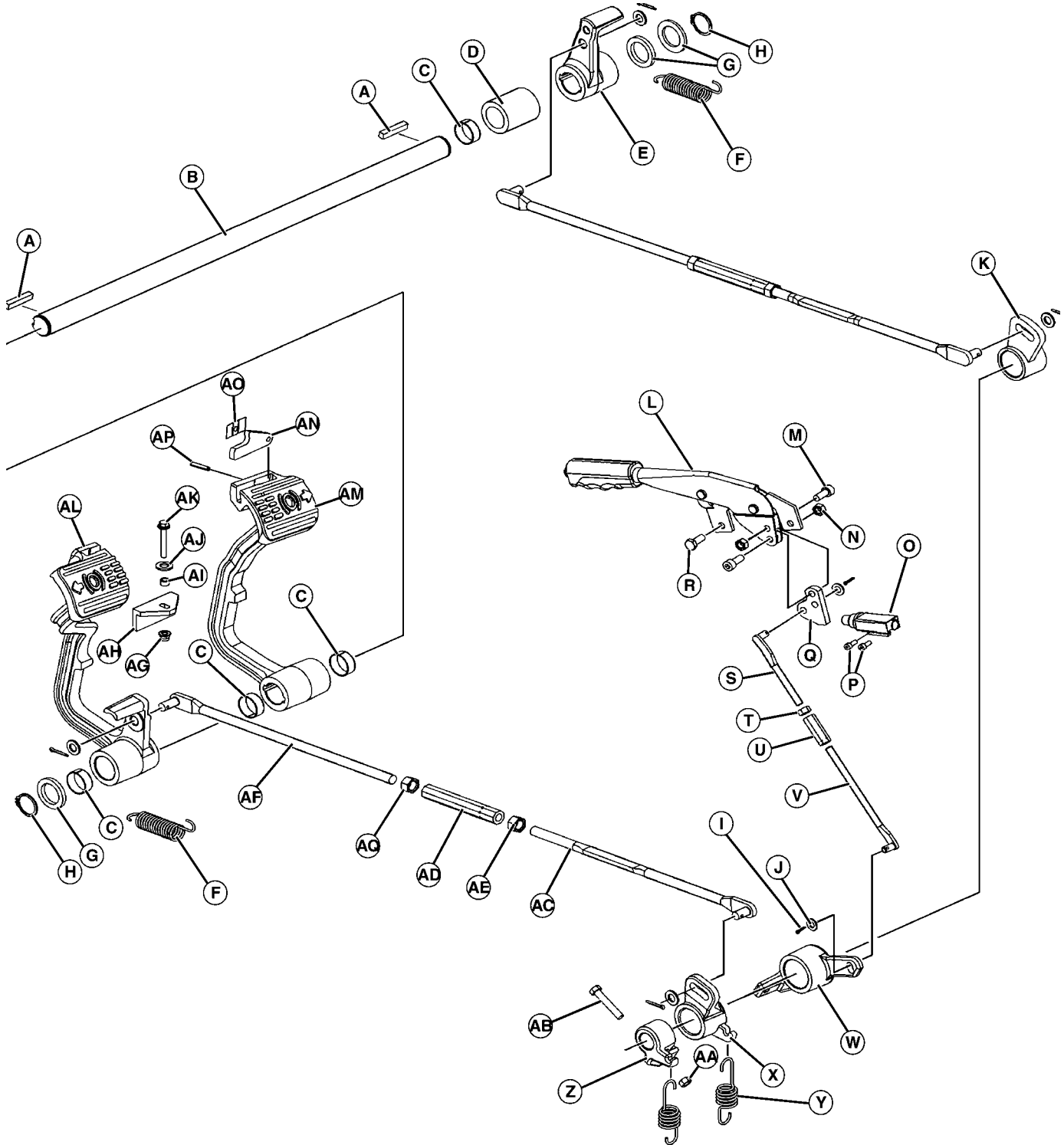
I— Park Brake Lever
J— Park Brake Rod
K—Brake Shaft Assembly
L— Park Brake Bell Crank
M—Actuator Cam

N—Park Brake Springs
O—Brake Assembly Pinion Shaft
P—Switch

LVAL12581 —UN—12NOV10

SW03989,0000CD2 -19-11NOV10-1/1

Brake Pedals and Linkage—eHydro™ (Exploded View)



LVAL12582—UN—12NOV10

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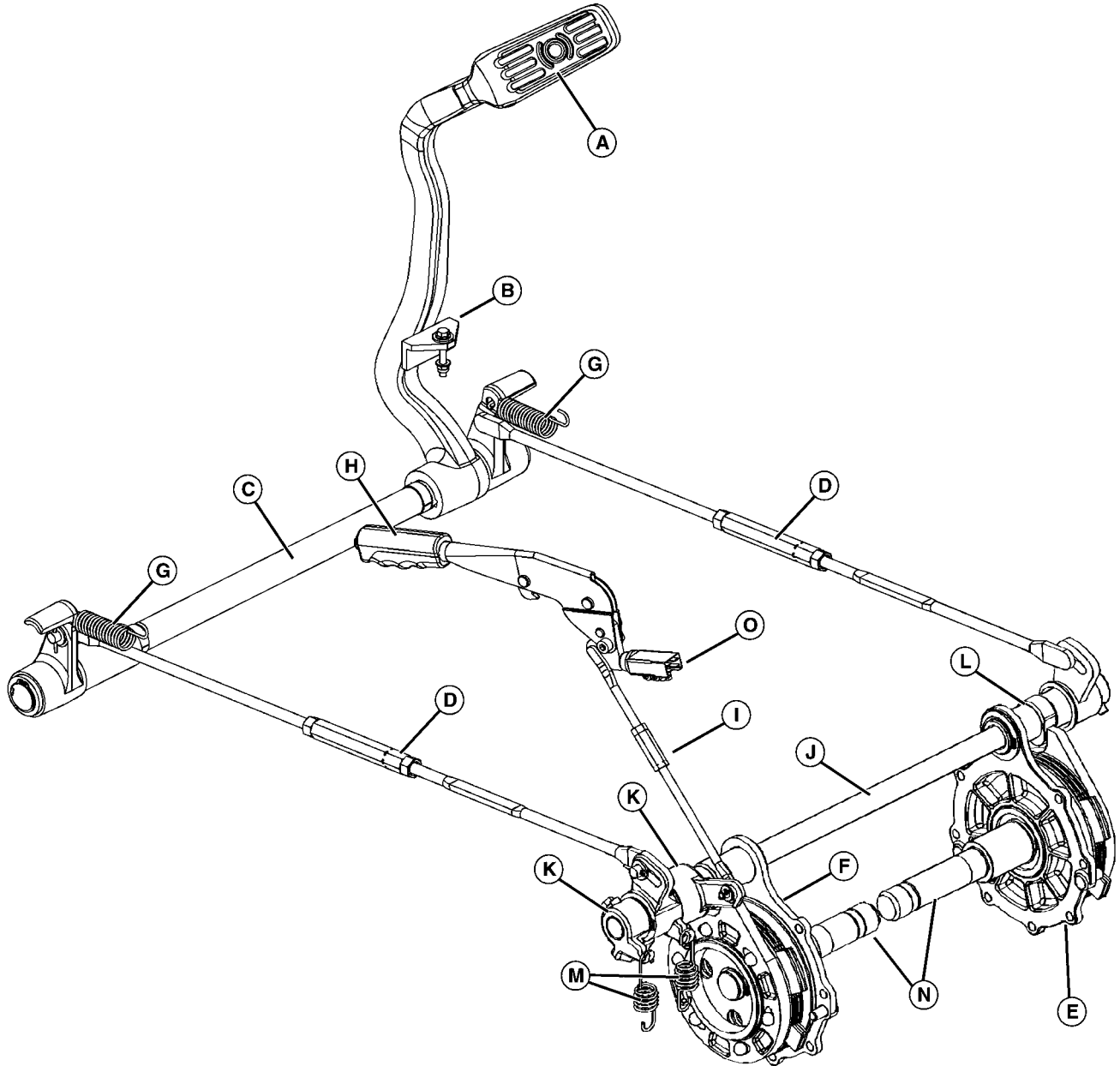
SW03989,0000CD3 -19-11NOV10-1/2

Component Location

A—Shaft Key (2 used)	J—Washer (6 used)	V—Rod	AG—Nut
B—Pedal Shaft	K—Bell Crank	W—Bell Crank	AH—Rubber Stop
C—Bushing (4 used)	L—Park Brake Lever	X—Bell Crank	AI—Bushing
D—Spacer	M—Socket Head Screw (2 used)	Y—Return Spring (2 used)	AJ—Washer
E—Bell Crank	N—Nut (2 used)	Z—Bell Crank	AK—Cap Screw
F—Return Spring (2 used)	O—Switch	AA—Nut	AL—Left Brake Pedal
G—Washer (3 used)	P—Screw (2 used)	AB—Cap Screw	AM—Right Brake Pedal
H—Snap Ring (2 used)	Q—Link	AC—Rod(2 used)	AN—Lever
I—Cotter Pin (6 used)	R—Cap Screw	AD—Turnbuckle (2 used)	AO—Leaf Spring
	S—Rod	AE—Nut (4 used)	AP—Spring Pin
	T—Nut	AF—Rod (2 used)	AQ—Nut
	U—Turnbuckle		

SW03989,0000CD3 -19-11NOV10-2/2

Brake Pedals and Linkage—AutoHST



A—Brake Pedal
B—Pedal Stop
C—Brake Pedal Cross Shaft
(through clutch housing)
D—Brake Rod (2 used)

E—Right Brake Assembly
F—Left Brake Assembly
G—Brake Pedal Return Springs
H—Park Brake Lever

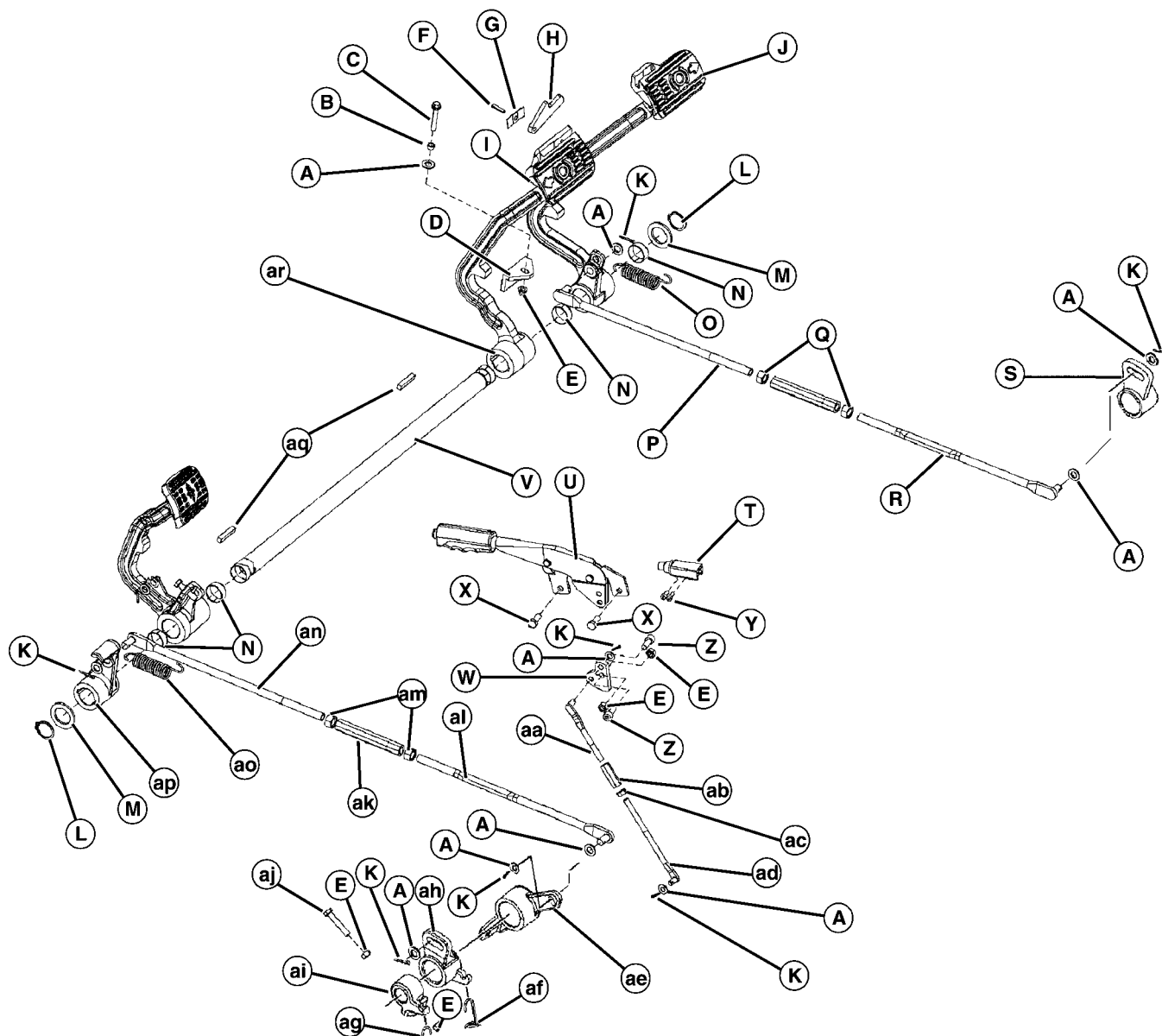
I— Park Brake Rod
J— Brake Shaft Assembly
K—Park Brake Bell Crank
L—Actuator Cam
M—Park Brake Springs

N—Brake Assembly Pinion Shaft
O—Switch

LVAL12563 —UN—12NOV10

SW03989,0000CD4 -19-11NOV10-1/1

Brake Pedals and Linkage—PRT



A—Washer
B—Spacer
C—Screw
D—Pad
E—Nut
F—Spring Pin
G—Spring
H—Pedal Locking Arm
I—Left Brake Pedal
J—Right Brake Pedal
K—Cotter Pin
L—Snap Ring
M—Washer
N—Bushing
O—RH Brake Return Spring

P—RH Upper Brake Rod
Q—Jam Nuts
R—RH Lower Brake Rod
S—RH Brake Bellcrank
T—Park Brake Switch
U—Park Brake Handle
V—Pedal Shaft
W—Actuator
X—Cap Screw
Y—Hex Head Screw
Z—Screw
AA—Upper Park Brake Rod

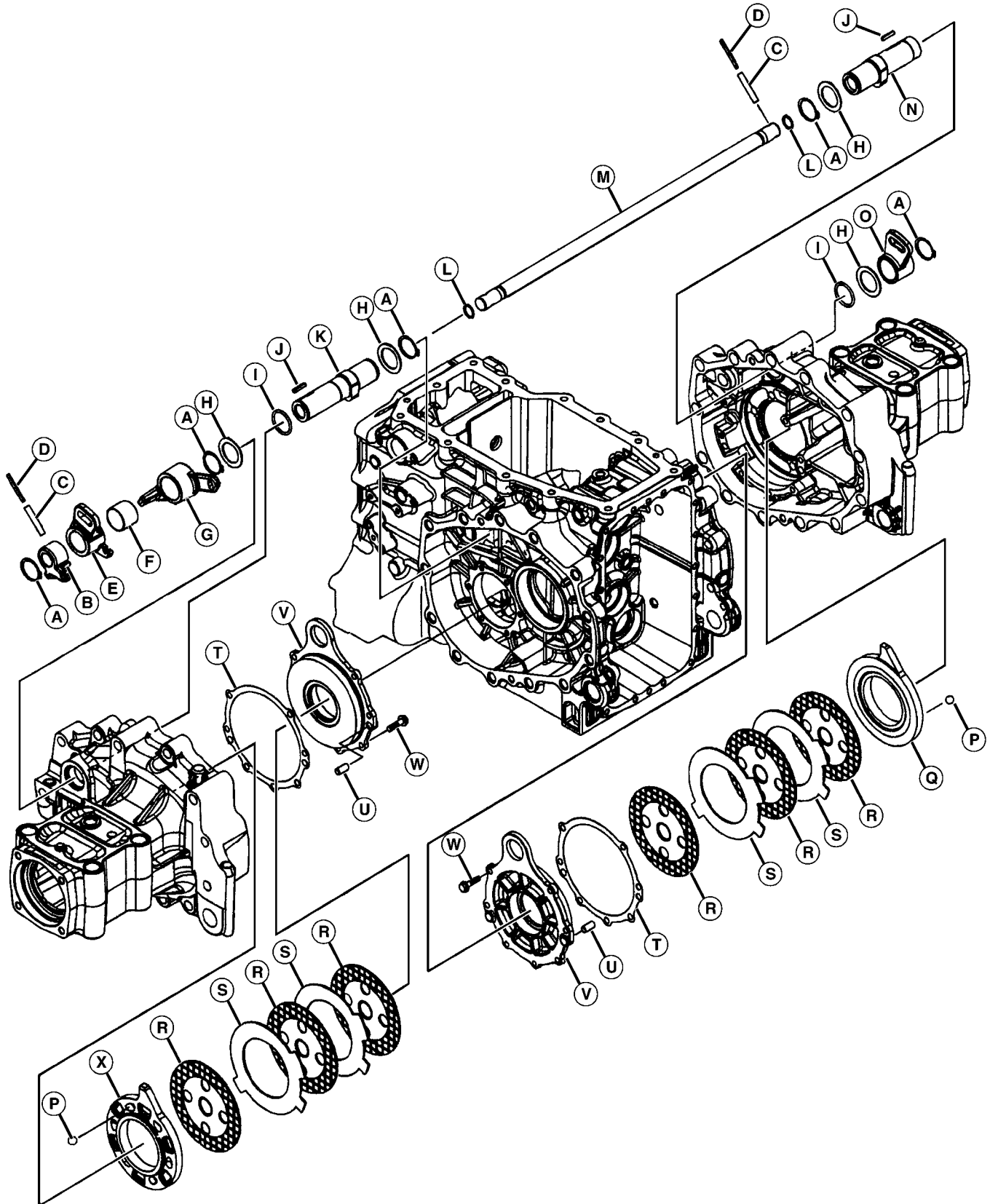
AB—LH Brake Turnbuckle
AC—Jam Nut
AD—Lower Park Brake Rod
AE—Bellcrank
AF—Brake Return Spring
AG—Park Brake Return Spring
AH—Park Brake Bellcrank
AI—Brake Return Spring Turnbuckle
AJ—Park Brake Adjustment Cap Screw

AK—Turnbuckle
AL—LH Lower Brake Rod
AM—Jam Nut
AN—LH Upper Brake Rod
AO—LH Brake Return Spring
AP—LH Brake Bellcrank

LVAL12594—UN—12NOV10

SW03989,0000CD5 -19-11NOV10-1/1

Brake Assembly



LVAL12585—UN—12NOV10

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SW03989,0000CD6 -19-11NOV10-1/2

Component Location

A—Snap Ring (5 used)	H—Washer 35x50x2 (4 used)	P—Ball 1/2 (6 used each side)	U—Dowel Pin (2 used)
B—Park Brake Arm	I— O-ring (2 used)	Q—Brake Actuator Plate (Right)	V—Brake Cover (2 used)
C—Spring Pin 8x50 (2 used)	J— Key (2 used)	R—Disc, Friction (3 used each side)	W—Bolt (7 used each side)
D—Spring Pin 5x50 (2 used)	K—Brake Cam (Left)	S—Plate, Friction (2 used each side)	X—Brake Actuator Plate (Left)
E—Brake Arm (Left)	L—O-ring (2 used)	T—Gasket, Brake Cover	
F—Bushing	M—Shaft, Brake Pedal		
G—Park Brake Arm (Left)	N—Brake Cam (Right)		
	O—Brake Arm (Right)		

SW03989,0000CD6 -19-11NOV10-2/2

Brakes

The brakes are mechanical wet disk brakes.

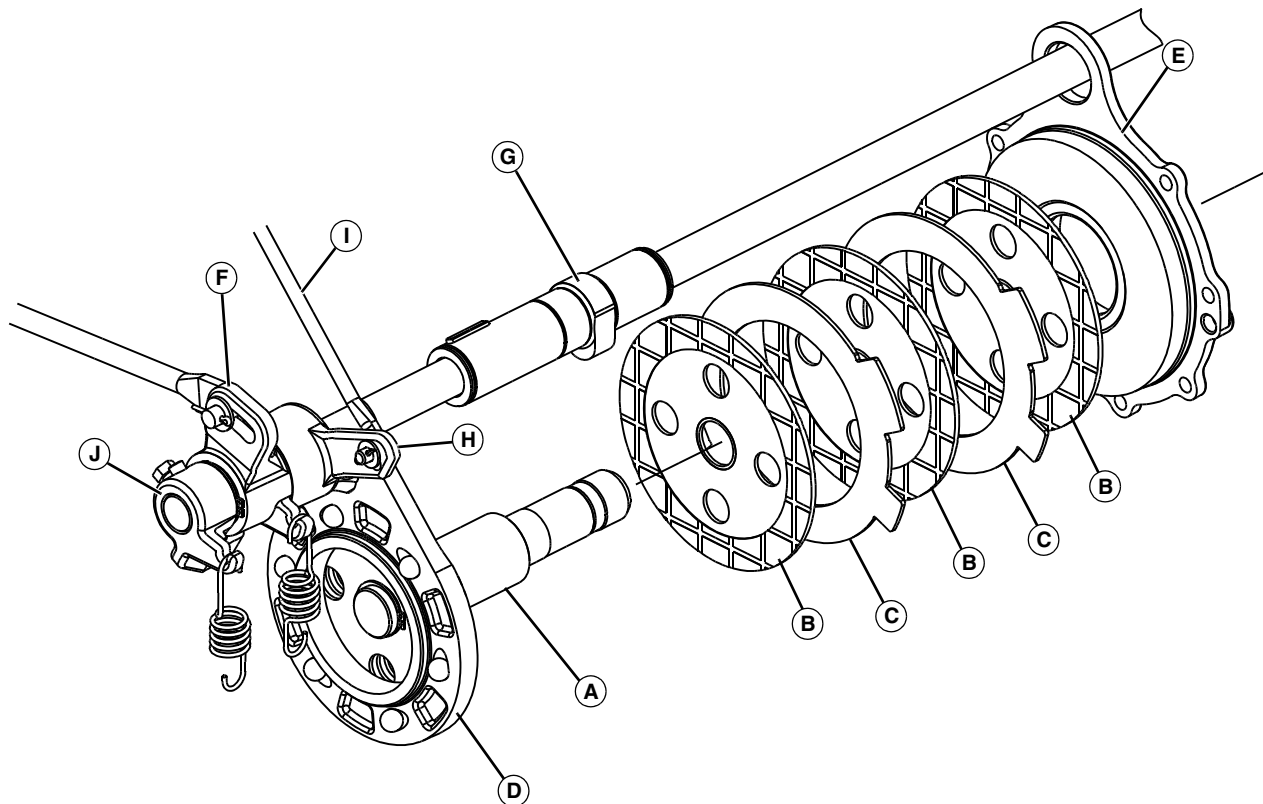
The brake assembly is bolted in the final drive housing and operates off the pinion shaft (A). There are three friction disks (B) and two friction plates (C) that are alternated between the actuator (D) and the brake cover (E). The brake cover and the actuator act like friction plates. The only components that rotate with the axle are the brake disks, which are splined to the pinion driveshaft.

When the brake pedal is pushed, the brake rod pulls the brake lever (F) forward. The brake lever is keyed to the brake shaft. This rotates the cam lever (G) which rotates the actuator (D). There are balls set in sockets in the final drive housing that the actuator rests on. The sockets in the actuator are ramped. As the actuator rotates, the balls force it toward the brake cover. This compresses the disks between the friction plates and stops rotation of the pinion shaft.

When the brake pedal is released, the return springs on the pedals pull the pedals back to the original position. When that occurs the cam lever rotates back allowing the actuator plate to go back to its original position, releasing the brakes.

Parking Brake

The parking brake uses linkage (I) and two bell cranks that are on the brake shaft. When the lever is pulled up, the linkage rotates bell crank (H). The bell crank has an adjustment bolt screwed through it. The adjustment screw pushes against another bell crank (J) and rotates it. Bell crank (J) is held to the brake shaft with a roll pin. When the bell crank rotates it rotates the brake shaft, turning the actuator cams which engage the brakes on both sides. The park brake is locked in position by a ratchet on the park brake lever. The brakes are held in position until the park brake release button is pushed, and the park brake lever is pushed down.



Left Side Shown

A—Pinion Shaft
B—Friction Disc (3 used)

C—Friction Plates (2 used)
D—Actuator
E—Brake Cover

F—Brake Lever
G—Cam Lever
H—Bell Crank

I—Linkage
J—Bell Crank

LVAL12586—UN—12NOV10

SW03989,0000CD7 -19-11NOV10-1/1

Brake Pedals and Linkage Checks

Symptom	Problem	Solution
Brake Pedals Do Not Operate Smoothly	Brake linkage damaged/binding.	Inspect for worn bushings or damage.
	Brake pedal free play not set to about 30 mm (1.2 in.)	Adjust pedals to specification. (See Brake Adjustment in Section 110, Group 25.)
	Total brake pedal travel not set to about 60 mm (2.4 in.)	Adjust brake pedals to specification. (See Brake Adjustment in Section 110, Group 25.)
	Brake pedal heights not within 2 mm (0.8 in.) of each other.	Adjust brake pedals to specification. (See Brake Adjustment in Section 110, Group 25.)
	Brake linkage bent or binding.	Adjust linkage to specification or repair or replace damaged parts.
	Park brake lever does not operate smoothly or is improperly adjusted.	Adjust to specification or replace damaged parts. (See Parking Brake Adjustment in Section 110, Group 25.)

SW03989,0000CD8 -19-11NOV10-1/1

Brake Operation Problems

Symptom	Problem	Solution
Steering or Machine Pulls In One Direction When Braking	Brake pedal interlock lever not engaged.	Lock pedals together.
	Brake pedals improperly adjusted	Adjust brakes. (See Brake Adjustment in Section 110, Group 25.)
	Brake linkage damaged or binding.	Repair or replace components as necessary.
	Brakes worn or no longer serviceable.	Repair or replace as necessary. (See Brake Disassemble and Inspect in Section 110, Group 30.)
Symptom	Problem	Solution
Brakes Drag or Slow To Release	Brake pedals improperly adjusted.	Adjust brakes. (See Brake Adjustment in Section 110, Group 25.)
	Brake linkage damaged or binding.	Repair or replace components as necessary.
	Brake return spring weak, damaged, or missing.	Repair or replace as necessary. (See Brake Disassemble and Inspect in Section 110, Group 30.)
Symptom	Problem	Solution
Brakes Not Effective	Brake pedals improperly adjusted.	Adjust brakes. (See Brake Adjustment in Section 110, Group 25.)
	Brake linkage damaged or binding.	Repair or replace components as necessary.
	Brake friction/stationary plates worn or damaged.	Repair or replace as necessary. (See Brake Disassemble and Inspect in Section 110, Group 30.)
	Brake actuator cam and/or actuator worn or damaged.	Repair or replace as necessary. (See Brake Disassemble and Inspect in Section 110, Group 30.)
	Actuator balls or sockets worn, pitted, or scored.	Repair or replace as necessary. (See Brake Disassemble and Inspect in Section 110, Group 25.)
Symptom	Problem	Solution
Excessive Pedal Travel	Brake pedals improperly adjusted.	Adjust brakes. (See Brake Adjustment in Section 110, Group 25.)
	Brake linkage damaged or binding.	Repair or replace components as necessary.

Continued on next page

SW03989,0000CD9 -19-14FEB11-1/2

Symptom	Problem	Solution
	Brake friction/stationary plates worn or damaged.	Repair or replace as necessary. (See Brake Disassemble and Inspect in Section 110, Group 30.)
	Brake actuator cam and/or actuator worn or damaged.	Repair or replace as necessary. (See Brake Disassemble and Inspect in Section 110, Group 30.)
	Actuator balls or sockets worn, pitted or scored.	Repair or replace as necessary. (See Brake Disassemble and Inspect in Section 110, Group 30.)
Symptom	Problem	Solution
Noise During Braking	Brake linkage damaged or binding.	Repair or replace components as necessary.
	Brake friction/stationary plates worn or damaged.	Repair or replace as necessary. (See Brake Disassemble and Inspect in Section 110, Group 30.)
	Brake actuator cam and/or actuator worn or damaged.	Repair or replace as necessary. (See Brake Disassemble and Inspect in Section 110, Group 30.)
	Actuator balls or sockets worn, pitted, or scored.	Repair or replace as necessary. (See Brake Disassemble and Inspect in Section 110, Group 30.)
Symptom	Problem	Solution
Oil Leaking From Final Drive Casing	Oil leaking from final drive casing at brake arms.	Replace brake shaft O-rings. (See Brake Shaft Removal and Installation in Section 110, Group 30.)

SW03989,0000CD9 -19-14FEB11-2/2

Internal Components

Symptom	Problem	Solution
Improper Brake Function	Brake friction materials excessively worn.	Replace friction plates and disks. (See Brake Disassemble and Inspect in Section 110, Group 30.)
	Brake actuators do not have smooth operation.	Replace any worn parts. (See Brake Disassemble and Inspect in Section 110, Group 30.)
	Steel balls or sockets pitted or scored.	Replace steel balls or actuator.

SW03989,0000CDA -19-14FEB11-1/1

Brake Adjustment

Reason:

To set the brake linkage free play to allow full pedal movement and full application of the brake disks on the rear axle shafts. The brakes are adjusted using adjustable turnbuckles to lengthen or shorten the brake rods.

NOTE: Perform brake pedal adjustment before performing parking brake adjustments.

Tools:

- Ruler
- Open End Wrenches

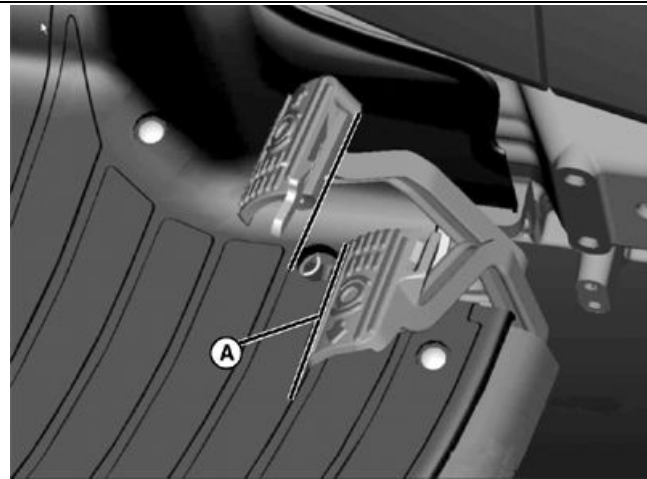
Procedure:

1. Park machine safely and block front wheels to prevent movement.
2. Lift both rear wheels off the ground.
3. Place a horizontal line on the wheels to observe wheel rotation.
4. Unlock brake pedals.
5. Measure travel of each pedal.
6. Adjust each turnbuckle on brake rod until the pedal travel (A) is within specification. Both pedals must travel the same distance.

Specification

Pedal Travel—Distance.....60 mm (2-3/8 in.)

7. Lock the pedals together.



A—Pedal Travel

NOTE: An assistant may be needed to perform the remaining steps.

8. Start the machine, place the transmission in Range B and set engine throttle speed to specification.

Specification

Engine Throttle—Speed.....2000 rpm

9. Depress forward control pedal.
10. Depress brake pedals.

11. Both hubs should slow down at the same rate of speed. If not, adjust the turnbuckles (B) until they slow down at the same rate of speed.
12. Hold the turnbuckle and tighten the jam nuts.
13. Lower the tractor to the ground.

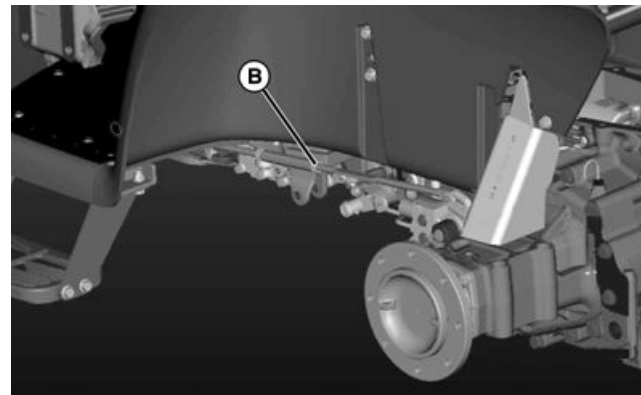
Results:

If the brakes are adjusted correctly:

- The brakes will begin engagement when the pedals are depressed. (See specification.)

Specification

Brake Engagement—Position.....60 mm (2-3/8 in.)



Wheel removed for clarity

B—Turnbuckle (2 used)

SW03989,0000CDB -19-12NOV10-2/2

LVAL12587—UN—04NOV10

LVAL12588—UN—18NOV10

Parking Brake Adjustment

1. Make sure that the machine is in 2WD.
2. Park machine safely and block front wheels.
3. Remove the rear wheels.
4. Mark a horizontal line on both wheel hubs to observe wheel RPM.

CAUTION: Avoid Injury! Brake return springs under high tension. Wear safety glasses and gloves when removing or installing springs from pedal.

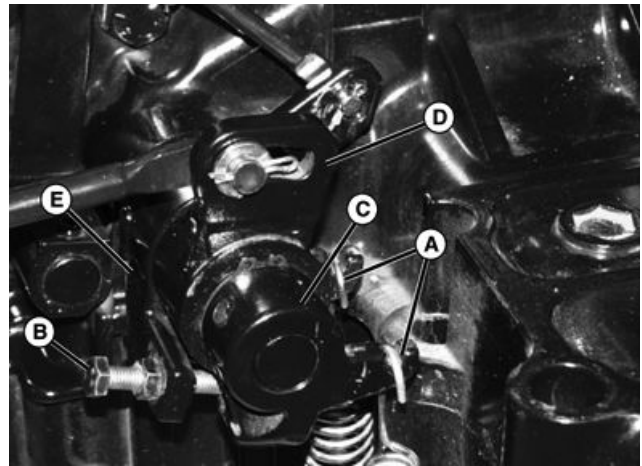
5. Remove the brake springs (A).
6. Loosen jam nut and back out cap screw (B) until gap between the cap screw and the park brake bell crank (C) is at specification.

Specification

Cap Screw and The Park

Brake Bell Crank—Gap..... 10 mm (0.4 in.)

7. Rotate brake bell crank (D) counter clockwise until it stops.
8. Hold brake bell crank (D) stationary, rotate park brake bell crank (E) counter clockwise until it contacts brake bell crank (D).



A—Brake Spring (2 used)
B—Cap Screw
C—Park Brake Bell Crank

D—Brake Bell Crank
E—Park Brake Bell Crank

9. Hold brake bell crank (D) and park brake bell crank (E) stationary, rotate park brake bell crank (C) counter clockwise until it stops.
10. Adjust cap screw (B) until it just contacts park brake bell crank (C). Tighten jam nut.
11. Engage the park brake lever two clicks from the bottom.

Continued on next page

SW03989,0000CDC -19-11NOV10-1/2

LVAL12589 —UN—18NOV10

12. Loosen jam nut (F) and adjust park brake rod until the play between the rod and park brake bell crank (E) is eliminated. Repeat on other side if necessary.
13. Tighten jam nut.
14. Replace the brake springs.
15. Start the machine, place the transmission in Range B and set engine throttle speed to specification.

Specification

Engine Throttle—Speed..... 1500 rpm

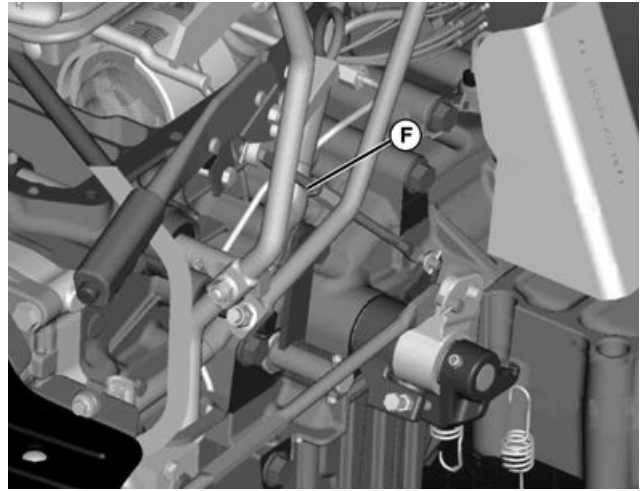
16. Depress forward control pedal.
17. Engage park brake to a minimum of five clicks.
18. Both wheels should slow down at the same rate of speed. See "Results" below.
19. Replace rear wheels and lower to the ground.

Results:

If both wheels slow down at the same rate, the park brake is correctly adjusted.

If the wheels slow down at different rates, or if only one slows down:

- Stop the engine.
- Loosen the jam nut and adjust cap screw (B)



F— Jam Nut

- Adjust the cap screw clockwise for the left wheel or counter clockwise for the right wheel.
- Tighten the jam nut.
- Start engine and repeat test to check that the wheels slow down at the same rate. Repeat procedure as necessary.

LVAL12590—UN—18NOV10

SW03989,0000CDC -19-11NOV10-2/2

Brake Pedal Assembly Removal and Installation

Removal:

1. Park machine safely.
2. Remove rear fenders. (See [Rear Fenders Removal and Installation](#) in Section 120, Group 10.)
3. Remove operator platform. (See [Operator Platform Removal and Installation](#) in Section 120, Group 10.)

CAUTION: Avoid Injury! Brake return springs under high tension. Wear safety glasses and gloves when removing or installing springs from pedal.

4. Disconnect brake pedal spring (A). Repeat on the other side.



A—Brake Pedal Spring

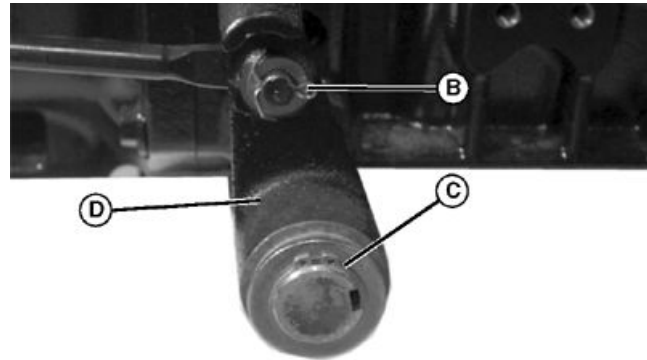
LVAL12591—UN—04NOV10

SW03989,0000CDD -19-14FEB11-1/5

5. Remove cotter pin and washer (B) from brake rod on right side of machine. Disconnect brake rod.
6. Remove snap ring and washers (C) and brake switch lever (D) from end of brake pedal shaft.

B—Cotter Pin and Washer
C—Snap Ring and Washers

D—Brake Switch Lever



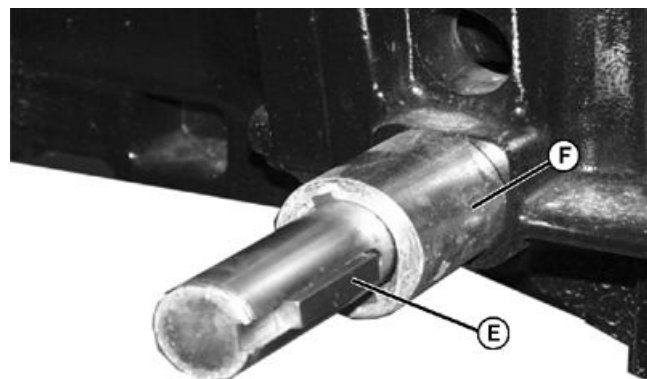
LVAL12592—UN—04NOV10

SW03989,0000CDD -19-14FEB11-2/5

7. Remove key (E) and spacer (F).

E—Key

F—Spacer



LVAL12593—UN—04NOV10

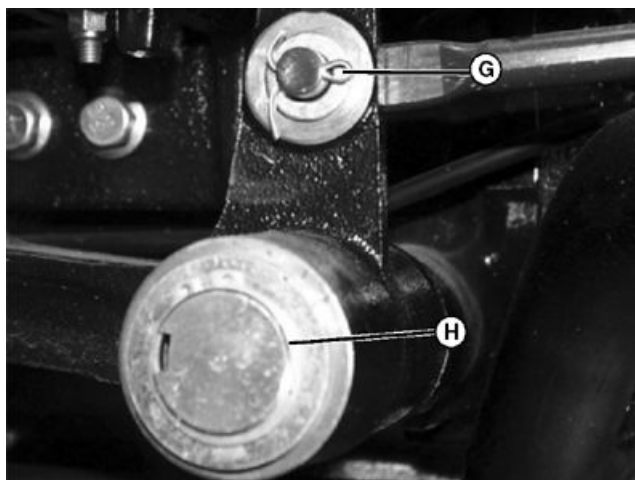
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SW03989,0000CDD -19-14FEB11-3/5

8. Remove cotter pin and washer (G) from brake rod on left side of machine.
9. Remove snap ring and washer (H).
10. Disconnect brake rod. Remove brake pedals.

G—Cotter Pin and Washer

H—Snap Ring and Washer



LVAL12594 —UN—04NOV10

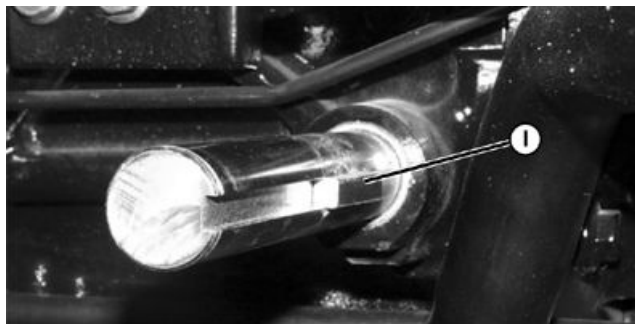
SW03989,0000CDD -19-14FEB11-4/5

11. Remove key (I) from brake shaft.
12. Remove brake shaft from clutch housing.
13. Inspect all parts, including bushings inside transmission, for wear or damage. Replace any worn or damaged components.

Installation:

Installation is the reverse of removal.

I—Key



LVAL12595 —UN—04NOV10

SW03989,0000CDD -19-14FEB11-5/5

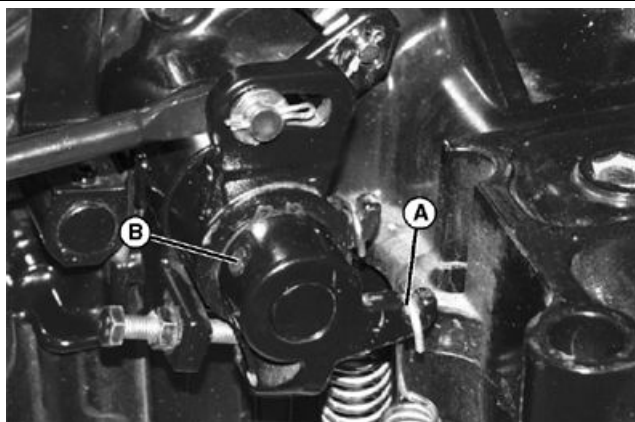
Brake Shaft Removal and Installation

Removal:

1. Block front wheels and release park brake.
2. Remove left rear wheel. (See [Rear Wheel Removal and Installation](#) in Section 120, Group 10.)
3. Remove left fender. (See [Rear Fenders Removal and Installation](#) in Section 120, Group 10.)
4. Disconnect brake spring (A).
5. Remove roll pin (B) and park brake bell crank.

A—Brake Spring

B—Roll Pin



LVAL12596 —UN—04NOV10

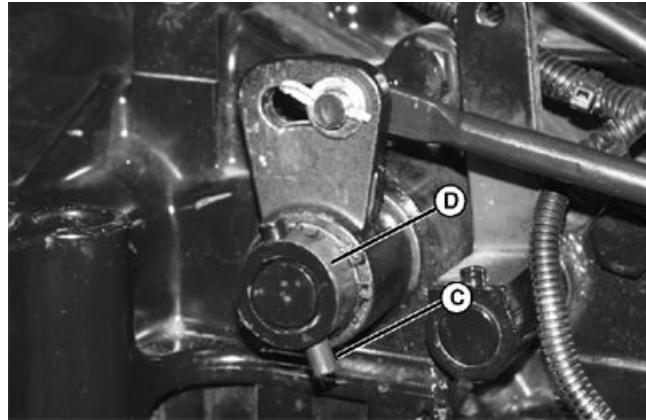
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SW03989,0000CDE -19-11NOV10-1/3

6. Remove roll pin (C) and collar (D).
7. Remove brake shaft from differential case.
8. Inspect all parts for wear or damage. Replace any worn or damaged parts.

C—Roll Pin

D—Collar



LVAL12597—UN—04NOV10

SW03989,0000CDE -19-11NOV10-2/3

9. Replace O-rings (E) on shaft.

LVAL12598—UN—04NOV10

Installation:

Installation is the reverse of removal.

- Adjust park brake. (See [Parking Brake Adjustment](#) in Section 110, Group 25.)
- Tighten wheel bolts to specification.

Specification

Wheel Bolts—Torque..... 140 N·m (103 lb.-ft.)



E—O-ring

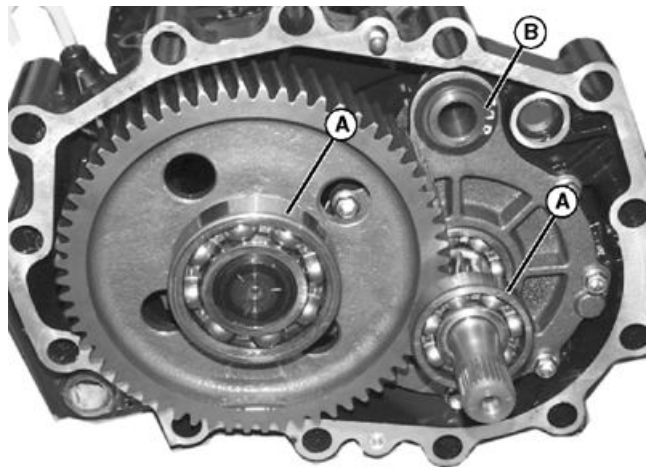
SW03989,0000CDE -19-11NOV10-3/3

Brake Disassemble and Inspect

1. Remove final drive. (See [Final Drive Removal](#) in Section 80, Group 40.)
2. Remove bearings (A) and final drive gear.
3. Remove snap ring (B).

A—Bearings (2 used)

B—Snap Ring



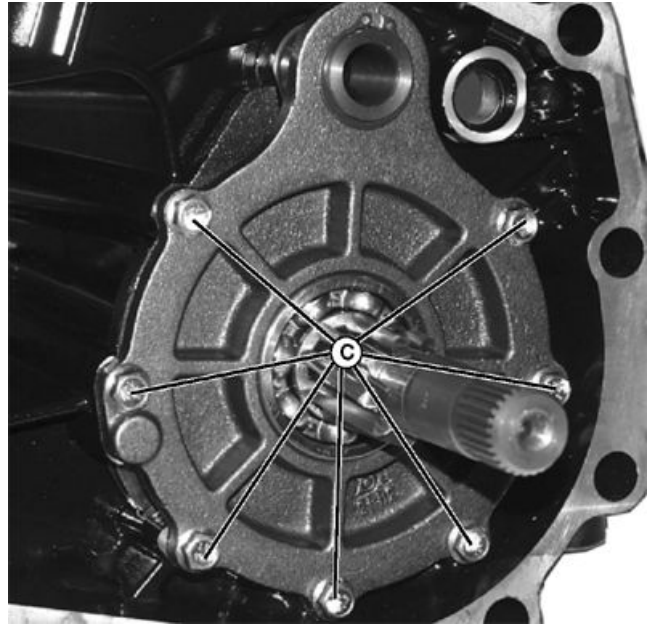
LVAL12599—UN—04NOV10

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SW03989,0000CDF -19-11FEB11-1/6

4. Remove seven cap screws (C) and remove brake assembly.

C—Cap Screw (7 used)



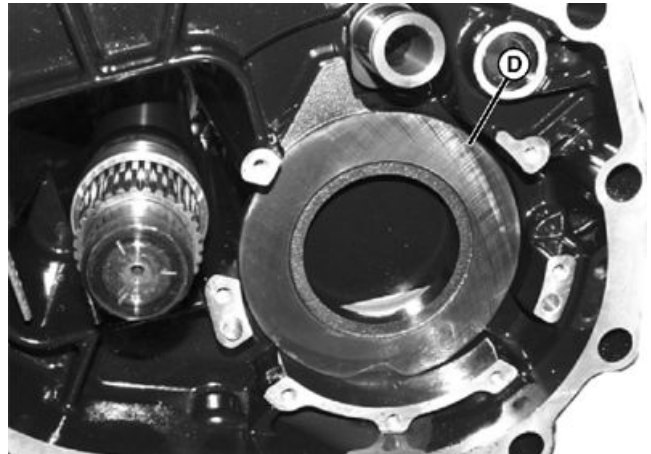
LVAL12600 —UN—04NOV10

SW03989,0000CDF -19-11FEB11-2/6

NOTE: If final drive housing is lying on its side, balls may fall out when park brake actuator plate is removed.

5. Remove brake actuator plate (D). Be careful not to lose any steel balls that may fall out when plate is removed.
6. Remove six steel balls from the final drive housing.
7. Inspect the steel balls and actuator plate for wear, galling, scratches, or cracking. Replace any worn or damaged parts.

D—Brake Actuator Plate



LVAL12601 —UN—04NOV10

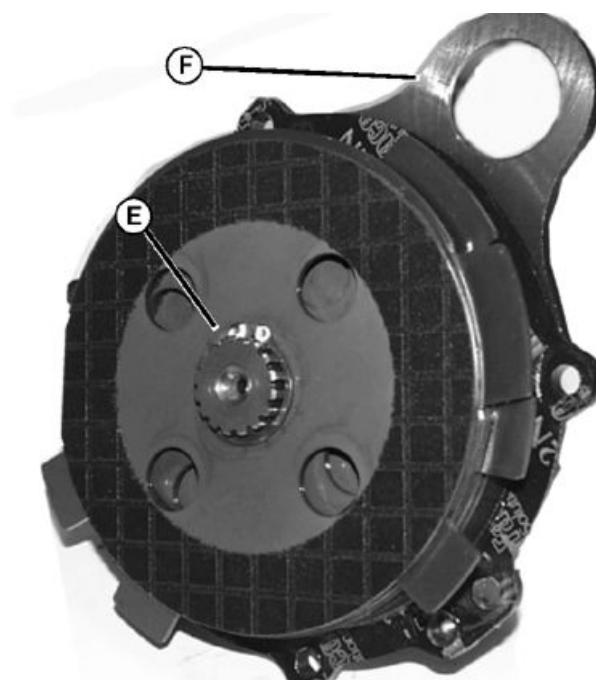
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SW03989,0000CDF -19-11FEB11-3/6

8. Remove snap ring (E). Disassemble brake assembly.
9. Remove old gasket from the mounting surfaces of the brake cover (F).
10. Inspect all parts for wear or damage. Replace any worn or damaged parts.

E—Snap Ring

F—Brake Cover



LVAL12602 —UN—04NOV10

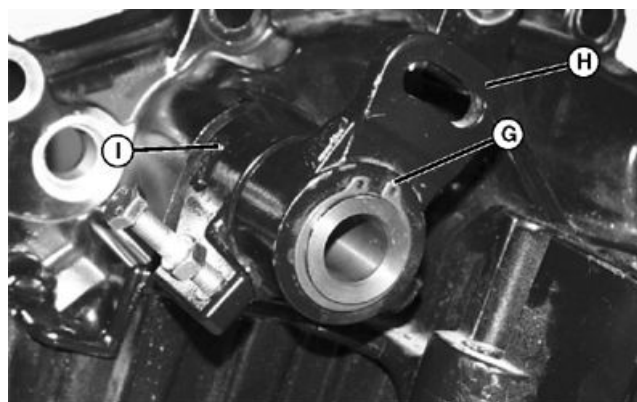
SW03989,0000CDF -19-11FEB11-4/6

11. Remove snap ring (G), brake bell crank (H), park brake bell crank (I), and shaft key.

G—Snap Ring

I—Park Brake Bell Crank

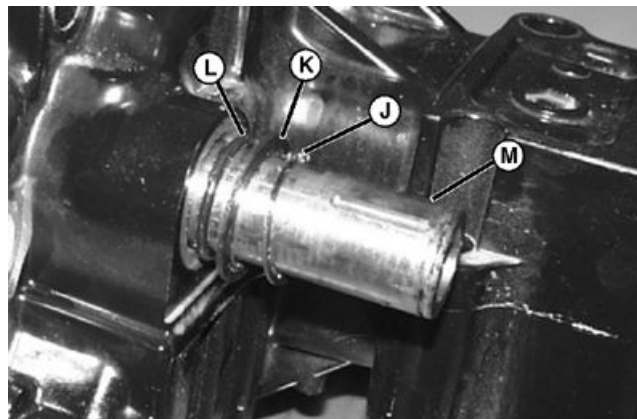
H—Brake Bell Crank



LVAL12603 —UN—04NOV10

SW03989,0000CDF -19-11FEB11-5/6

12. Remove snap ring (J), washer (K), and O-ring (L).
13. Remove the park brake actuator cam (M).
14. Inspect the brake actuator cam and final drive housing for wear or damage. Replace any worn or damaged parts.

J—Snap Ring
K—WasherL—O-ring
M—Park Brake Actuator Cam

LVAL12604 —UN—04NOV10

SW03989,0000CDF -19-11FEB11-6/6

Brake Assemble

1. Install brake actuator cam into final drive housing. Replace O-ring and retain with washer and snap ring.
2. Install park brake bell crank, shaft key, and brake bell crank on brake actuator cam.
3. Dip the six steel balls in transmission oil. Install the balls into the final drive housing.

NOTE: Be certain the steel balls locate into the ramps of the actuator.

4. Dip the brake actuator plate in transmission oil. Install the plate into the final drive housing. Be certain that steel balls locate into the ramps of the plate.
5. Install new gasket (A) on to the brake cover.
6. Dip the friction plates and the friction disks in transmission oil. Install friction disk (B) first, then install friction plate (C). Alternate disks and plates, ending with a disk.
7. Secure disks and plates with snap ring.



A—New Gasket
B—Friction Disk

C—Friction plate

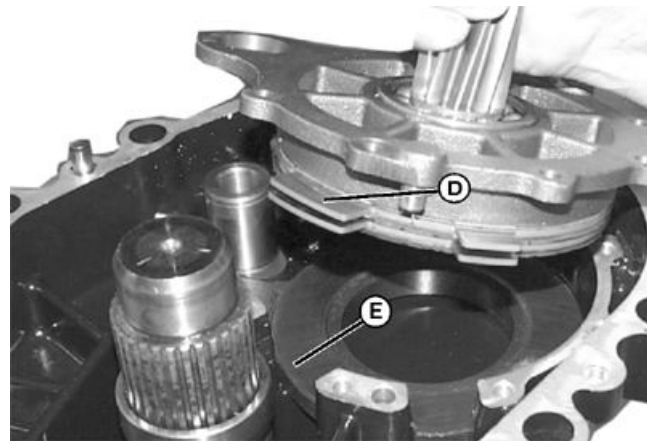
LVAL12605—UN—04NOV10

SW03989,0000CE0 -19-11FEB11-1/2

8. Install brake assembly into final drive housing by aligning tab (D) with slot (E).
9. Secure with cap screws.
10. Tighten cap screws to specification.
11. Install washer and snap ring on brake actuator cam.
12. Install final drive gear.
13. Install bearings on axle shaft and pinion shaft.
14. Install final drive to transmission case. (See [Final Drive Installation](#) in Section 80, Group 40.)
15. Adjust brake pedals. (See [Brake Adjustment](#) in Section 110, Group 25.)

Specification

Brake Assembly Cap
Screw Torque—Torque..... 28 N·m (21 lb.-ft.)



D—Aligning Tab

E—Slot

LVAL12606—UN—04NOV10

SW03989,0000CE0 -19-11FEB11-2/2

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Rear Wheel Removal and
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Torque Specifications

Item	Measurement	Specification
Torque Specifications		
Wheel Bolt	Torque	140 N·m (103 lb.-ft.)
Steering Wheel Nut	Torque	39—49 N·m (29—36 lb.-ft.)
Center Link Spring Holder	Torque	50 N·m (37 lb.-ft.)
ROPS Cap Screw	Torque	230 N·m (170 lb.-ft.)

SW03989,0000CE1 -19-05NOV10-1/1

Front Wheel Removal and Installation

Removal:

1. Loosen lug nuts slightly before raising front axle.
2. Raise front of machine and lower onto support stands so that machine is supported by front axle.

NOTE: If the front wheels are being removed to perform work on the front axles, lower machine onto suitable stands that will support the machine by the frame.

3. Remove six lug bolts and wheel.

Installation:

1. Install wheels onto axle. Insert lug bolts and lightly tighten bolts.
2. Raise front of machine, remove support stands and lower machine to floor.
3. Tighten lug bolts to specification.

Specification

Front Wheel Lug
Bolt—Torque..... 140 N·m (103 lb.-ft.)

SW03989,0000CE2 -19-05NOV10-1/1

Rear Wheel Removal and Installation

Removal:

1. Loosen lug bolts slightly before raising machine rear axle.
2. Raise rear of machine and lower onto support stands so that machine is supported by rear axle.
3. Remove eight lug bolts and wheel.

Installation:

1. Install wheels onto axle, insert lug bolts, and lightly tighten bolts.

2. Raise rear of machine, remove support stands and lower machine to floor.
3. Tighten lug bolts to specification.

Specification

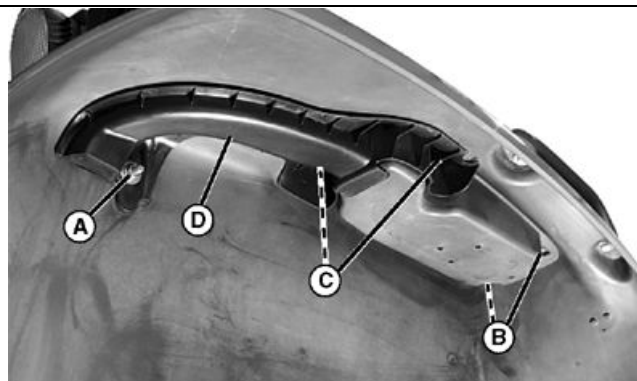
Rear Wheel Lug
Bolt—Torque..... 140 N·m (103 lb.-ft.)

SW03989,0000CE3 -19-05NOV10-1/1

Rear Fenders Removal and Installation

Removal:

1. Remove rear wheels, if desired, to ease fender removal. (See [Rear Wheel Removal and Installation](#).)
2. Remove nut and washer (A) securing upper fender to ROPS.
3. Right side fender shown:
 - a. If switches are present in right side control panel, remove two screws (B), two cap screws (C) and cover (D).
 - b. Lift control panel on top of fender. Disconnect all electrical connectors from switches.



A—Nut and Washer
B—Screw (2 used)

C—Cap Screw (2 used)
D—Cover

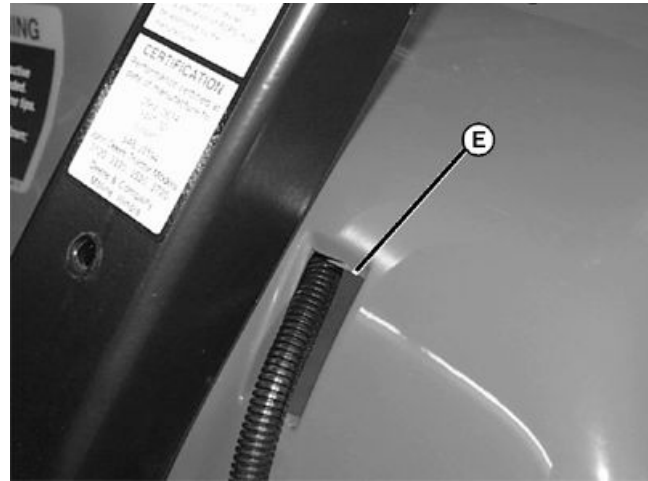
LVAL12607 —UN—29OCT10

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SW03989,0000CE4 -19-19DEC12-1/5

4. Remove wiring harness (if installed) from hole (E) in right fender.

E—Wiring Harness

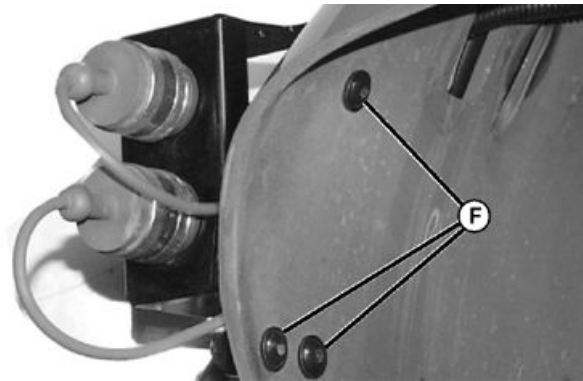


LVAL12608 —UN—29OCT10

SW03989,0000CE4 -19-19DEC12-2/5

5. Remove wiring harness (if installed) from hole (E) in right fender.

F—Bolt (3 used)

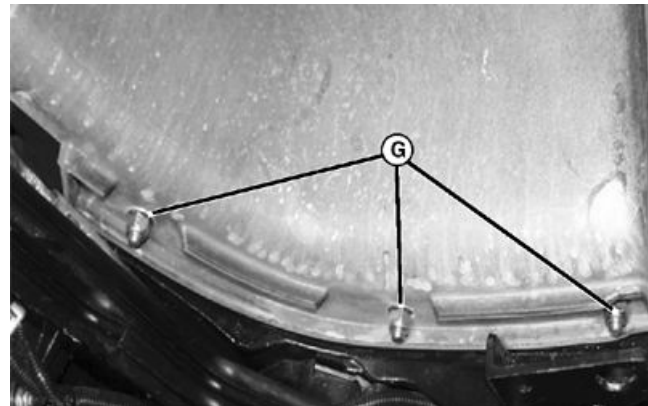


LVAL12609 —UN—29OCT10

SW03989,0000CE4 -19-19DEC12-3/5

6. Remove three lock nuts (G) from carriage bolts securing front of fender to operator platform.

G—Lock Nut (3 used)



LVAL12610 —UN—29OCT10

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SW03989,0000CE4 -19-19DEC12-4/5

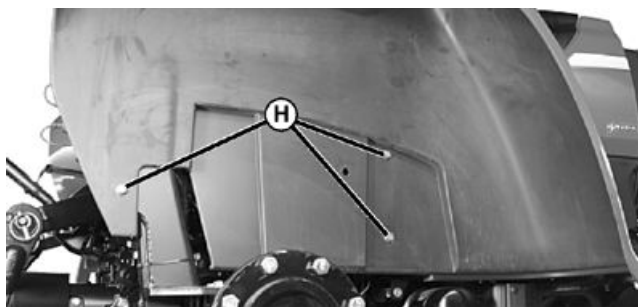
IMPORTANT: Avoid Damage! Have an assistant support the fender when removing the cap screws securing it to the frame.

- Remove three fasteners (H) securing fender to seat support bracket and ROPS. Remove fender.

Installation:

Installation is the reverse of removal.

H—Fastener (3 used)



LVAL12611 —UN—29OCT10

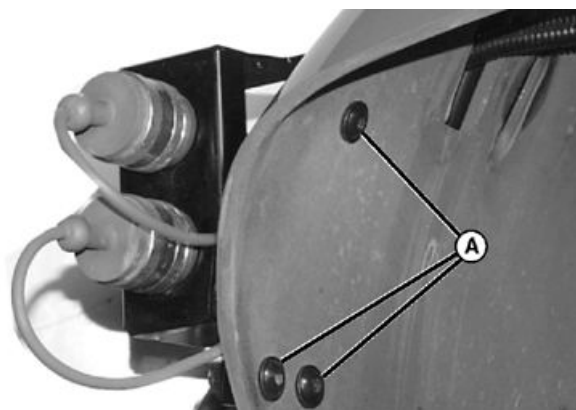
SW03989,0000CE4 -19-19DEC12-5/5

Rear Breakaway Coupler Removal and Installation

Removal:

- Remove three bolts (A) from breakaway coupler bracket. Remove bracket from fender.
- Remove fender. (See [Rear Fenders Removal and Installation](#).)

A—Bolt (3 used)



LVAL12612 —UN—29OCT10

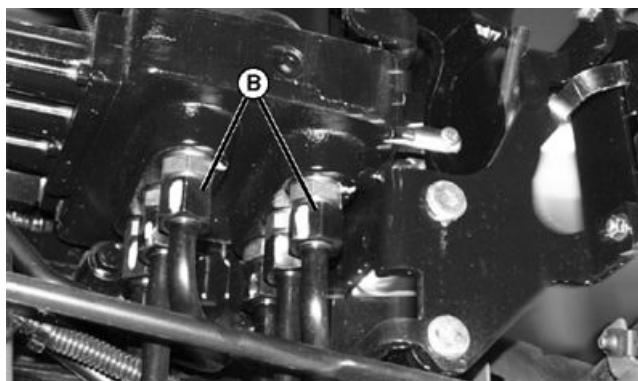
SW03989,0000CE5 -19-19DEC12-1/2

- Loosen nuts (B). Remove lines from valve block.

Installation:

Installation is the reverse of removal.

B—Nut (6 used)



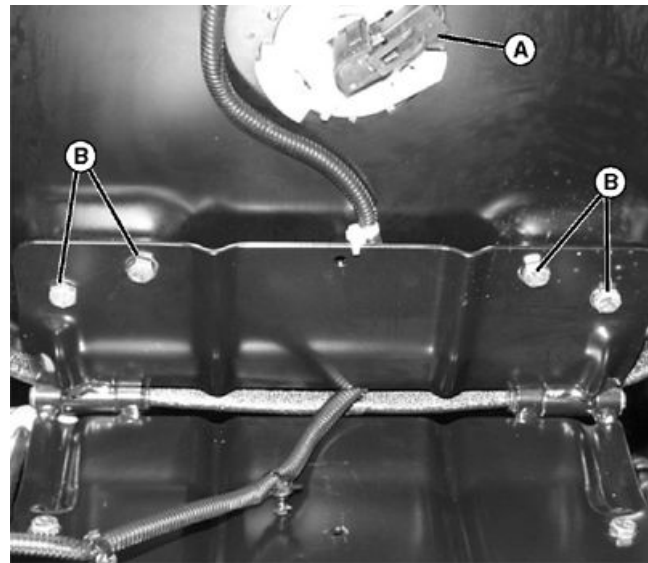
LVAL12613 —UN—29OCT10

SW03989,0000CE5 -19-19DEC12-2/2

Seat and Seat Support Removal and Installation

Removal:

1. Disconnect seat switch electrical connector (A) beneath seat.
2. Remove four cap screws (B) attaching seat pivot plate to seat. Remove seat.
3. Gently pry seat switch wiring harness retainers to remove from seat support. Move wiring harness out of the way.
4. Remove two cap screws and washers at the rear of seat support attaching seat support to rockshaft housing.
5. Remove two cap screws and washers at the front of seat support attaching seat support to operators platform.
6. Remove seat support.



A—Electrical Connector

B—Cap Screws (4 used)

Installation:

Installation is the reverse of removal.

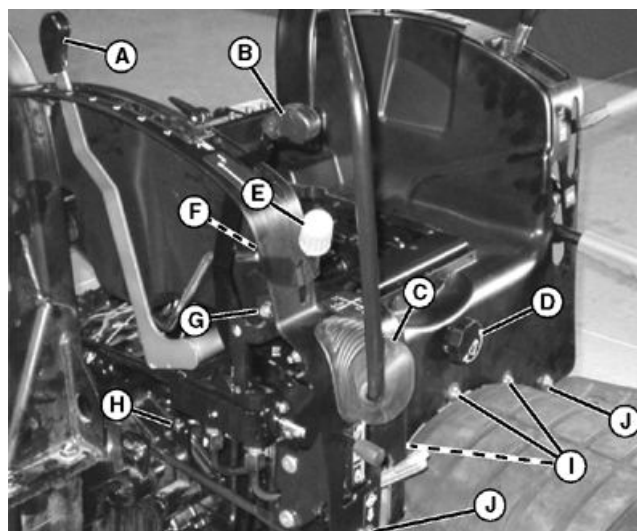
LVAL12614 —UN—29OCT10

SW03989,0000CE6 -19-11NOV10-1/1

Seat Closeout Removal and Installation

Removal:

1. Park machine on a level surface with wheels blocked to prevent machine movement.
2. Remove rear wheels. (See [Rear Wheel Removal and Installation](#).)
3. Remove rear fenders. (See [Rear Fenders Removal and Installation](#).)
4. Remove seat and seat support. (See [Seat and Seat Support Removal and Installation](#).)
5. Remove knobs on the rockshaft control lever (A) and third SCV lever (if equipped) (B).
6. Unscrew SCV shift knob. Remove rubber boot (C) from SCV shift.
7. Remove rockshaft rate of drop knob (D) from control shaft at front edge of seat.
8. If equipped with a two-speed PTO:
 - a. Remove knob on the PTO selection control lever (E).
 - b. Remove the cotter pin, washer, and two-speed PTO shift link (F) from the selection lever.
 - c. Remove the shoulder bolt (G) and the PTO selection control lever.
9. Remove the spring pin (H) and disconnect the differential lock link from the lock lever.

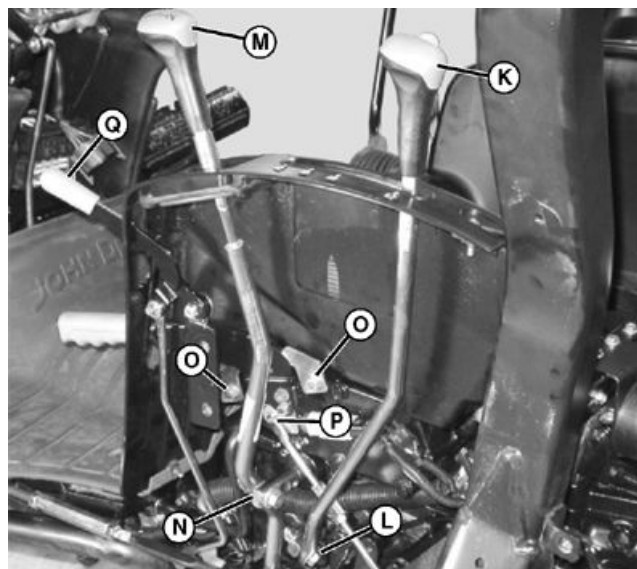


- A—Rockshaft Control Lever
B—Third SCV Lever (if equipped)
C—Rubber Boot
D—Rockshaft Rate of Drop Knob
E—PTO Selection Control Lever Knob
F—PTO Two Speed Shift Link
G—Shoulder Bolt
H—Spring Pin
I—Nuts (3 used)
J—Cap Screws (2 used)

10. Remove three nuts (I) and washers. Remove cap screws (J) and washers.

SW03989,0000CE7 -19-19DEC12-1/3

11. Remove cap (K) on range shift knob. Remove cap screw and knob.
12. Remove the cap screw (L) securing the range shift lever to the shift shaft and remove shift lever.
13. PRT models: Remove cap (M) on transmission shift knob. Remove cap screw and knob.
14. Remove the nut and shoulder bolt (N) securing the transmission shift lever to the shift shaft and remove shift lever.
15. Remove the two cap screws (O) securing the park brake lever to the rockshaft.
16. Remove the cotter pin and washer (P) and disconnect the brake link from park brake lever.
17. Remove knob on the MFWD selection control lever (Q).



PowrReverser™ (PRT) Model Shown

- K—Range Shift Knob Cap
L—Cap Screw
M—Transmission Shift Knob Cap
N—Shoulder Bolt
O—Cap Screws (2 used)
P—Washer
Q—MFWD Selection Control Lever Knob

Continued on next page

SW03989,0000CE7 -19-19DEC12-2/3

18. Remove four cap screws (R) securing closeout to crossbar. Remove cap screw (S) on both sides.

19. Remove any other accessories and hardware that may secure the closeout to machine.

IMPORTANT: Avoid Damage! Gently flex the closeout panel while removing and installing. Do not over flex or the closeout panel will break.

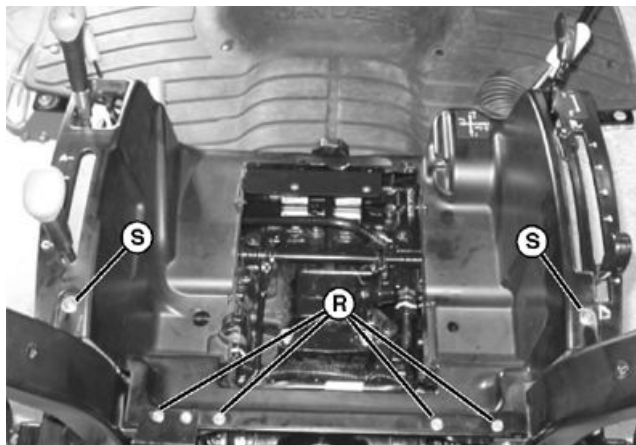
20. Carefully remove closeout from machine.

Installation:

Installation is the reverse of removal.

R—Cap Screw (4 used)

S—Cap Screw (2 used)



LVAL12617 —UN—29OCT10

SW03989,0000CE7 -19-19DEC12-3/3

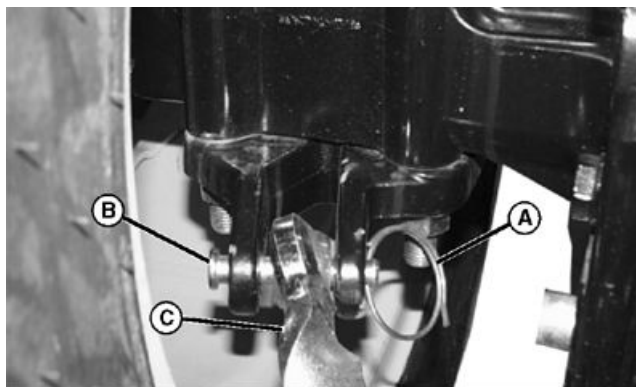
Roll Over Protection System (ROPS)

Removal:

1. Remove rear wheels and tires. (See [Rear Wheel Removal and Installation.](#))
2. Remove quick lock ring (A) and pin (B). Disconnect sway bar (C) from lower left side ROPS bracket. Repeat for right side.

A—Quick-Lock Ring
B—Pin

C—Sway Bar



LVAL12618 —UN—29OCT10

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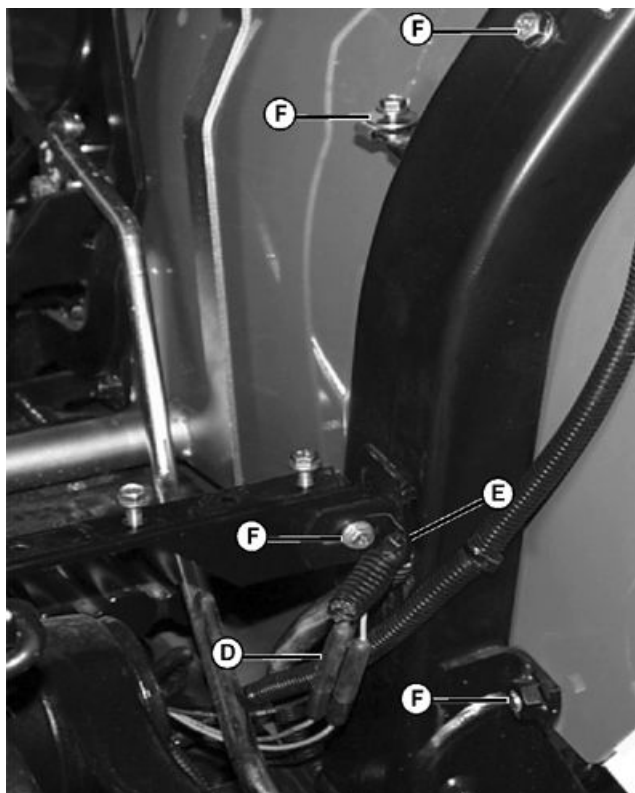
SW03989,0000CE8 -19-19DEC12-1/4

3. Disconnect all warning light leads (D) at base of right side ROPS and cut tie strap (E). Repeat for left side.
4. Remove and retain cap screws (F) securing right side ROPS to fender and seat brace. Repeat for left side.

CAUTION: Avoid Injury! Machine component is heavy. Use a safe lifting device or get an assistant to help lift and hold component into place for installation.

5. Support ROPS with a suitable lifting device.

D—Warning Light Lead (4 used) F—Cap Screw (4 used)
E—Tie Strap



Seat (base shown removed)

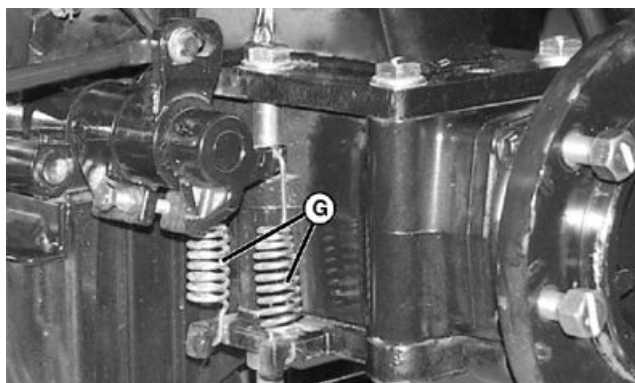
SW03989,0000CE8 -19-19DEC12-2/4

LVAL12619 —UN—29OCT10

CAUTION: Avoid Injury! Springs are installed under tension. Use caution when attaching or disconnecting springs. Wear eye protection.

6. Remove brake springs (G) from lower left ROPS bracket.

G—Brake Spring (2 used)



Continued on next page

SW03989,0000CE8 -19-19DEC12-3/4

LVAL12620 —UN—29OCT10

7. Remove four nuts (J).
8. Remove and discard cap screws (I). Repeat for the left side.
9. Lift and remove ROPS from machine.

Installation:

Installation is the reverse of removal.

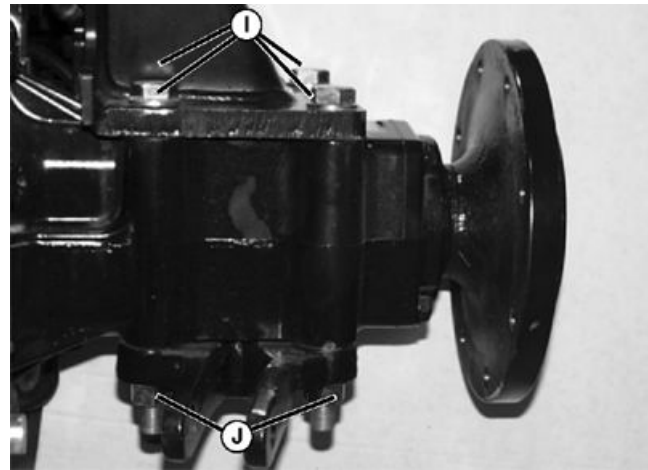
⚠ CAUTION: Avoid Injury! Replace the cap screws whenever the ROPS is removed. Always use new, non-flanged, grade 10.9 cap screws.

Replace discarded cap screws with new cap screws.

Evenly tighten cap screws to specification.

Specification

ROPS Hard-
ware—Torque..... 230 N·m (170 lb.-ft.)



Fender Removed For Clarity (right side shown)

J— Nut (4 used)

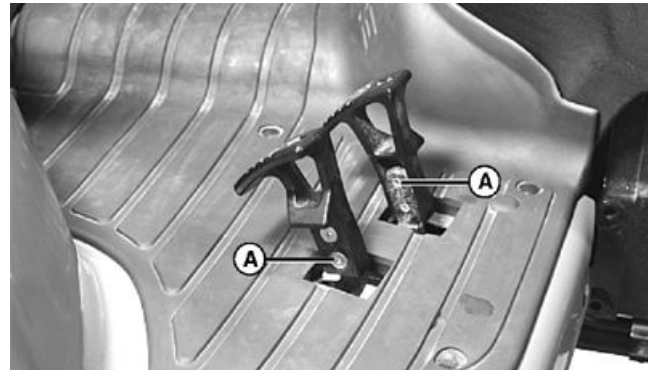
LVAL12621—UN—29OCT10

SW03989,0000CE8 -19-19DEC12-4/4

Operator Platform Removal and Installation

Removal:

1. Park machine safely on a level surface with wheels blocked to prevent machine movement.
2. Remove rear fenders, if desired, to ease operator platform removal. (See [Rear Fenders Removal and Installation](#).)
3. Remove seat and seat support. (See [Seat and Seat Support Removal and Installation](#).)
4. Remove seat closeout panel. (See [Seat Closeout Removal and Installation](#).)
5. Remove fuse panel cover. (See [Fuse Panel Cover Removal and Installation](#).)
6. Remove socket head screws (A) and forward and reverse pedals at right side of platform.
7. Remove plastic rivets holding floor mat to operators platform.



eHydro™ Model Shown

A—Socket Head Screw (4 used)

8. Remove floor mat.

LVAL12622—UN—29OCT10

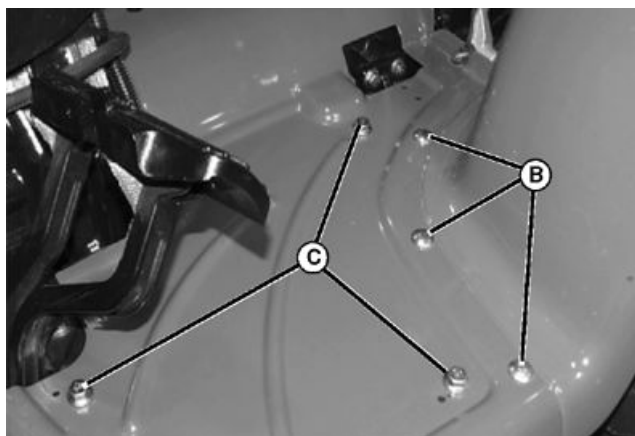
Continued on next page

SW03989,0000CE9 -19-19DEC12-1/3

9. Remove nuts and carriage bolts (B) securing operator platform to fenders, If not already removed. Repeat on other side.
10. Remove cap screws (C), lock nuts, and washers from rubber isolators attaching platform to frame. Repeat on other side.

B—Carriage Bolt (3 used)

C—Cap Screw (3 used)



LVAL12623—UN—29OCT10

SW03989,0000CE9 -19-19DEC12-2/3

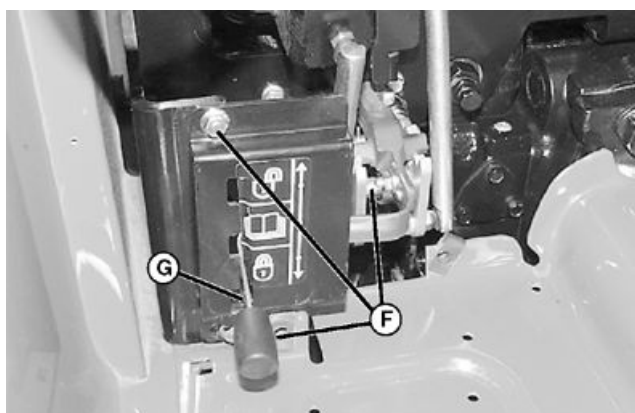
11. Remove nuts and cap screws (F) securing SCV lock lever (G) and plate. Remove lever and plate.
12. Disconnect differential lock linkage. Move differential lock pedal out of the way.
13. Remove operator platform. Inspect rubber isolators for cracks and deterioration. Replace as necessary.

Installation:

Installation is the reverse of removal.

F—Cap Screws (3 used)

G—SCV Lock Lever



LVAL12624—UN—29OCT10

SW03989,0000CE9 -19-19DEC12-3/3

Battery Removal and Installation

Removal:

1. Raise hood.
2. Disconnect negative (-) battery cable.
3. Disconnect positive (+) battery cable.
4. Loosen bolts (A). Remove battery hold down clamps.
5. Remove battery.

Installation:

Installation is the reverse of removal.



A—Bolt (2 used)

LVAL12625—UN—29OCT10

SW03989,0000CEA -19-05NOV10-1/1

Fuse Panel Cover Removal and Installation

Removal:

1. Lift the two latch handles.
2. Grasp the latch handles and pull rearward on cover to disengage.

3. Tilt top of cover towards seat.
4. Lift cover and set to the side.

Installation:

Installation is the reverse of removal.

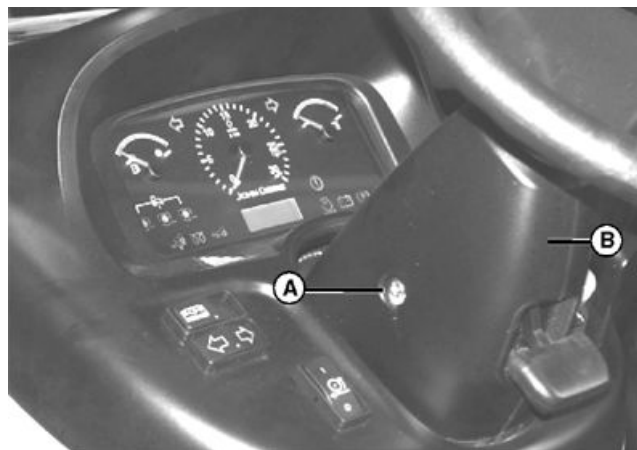
SW03989,0000CEB -19-05NOV10-1/1

Cowl Panel Removal and Installation

The control panel and the two cowl panels are interlocked when assembled, so all three pieces are involved during removal or installation of an individual component. The key switch is mounted in the left side cowl panel.

Removal:

1. Disconnect negative (-) battery cable.
2. Remove hood. (See [Hood Removal and Installation](#).)
3. Remove the two screws (A) securing the steering column covers (B). Remove the covers.
4. Tilt the steering column fully downwards.
5. Pull the engine speed control lever fully rearward to the slow idle position.
6. PRT models: Pull the PRT shift lever rearward to the reverse position.
7. Remove fuse panel cover. (See [Fuse Panel Cover Removal and Installation](#).)



eHydro™ Model Shown

A—Screw (2 used)

B—Column Cover (2 used)

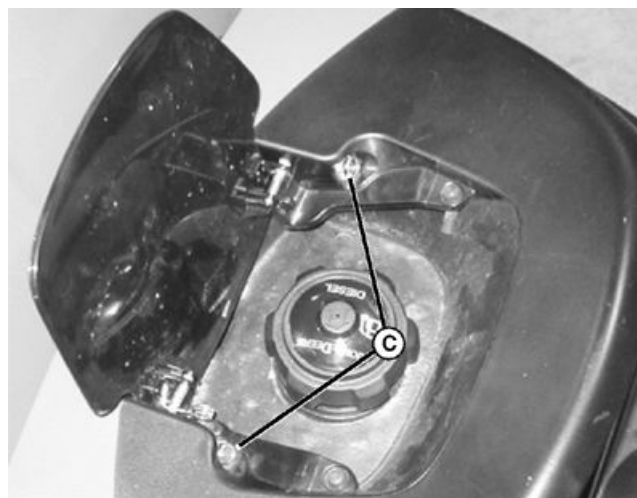
8. Open fuel filler door.

LVAL12626 —UN—29OCT10

SW03989,0000CEC -19-19DEC12-1/5

9. Remove two cap screws (C). Do not to lose the locknuts, located in slots in the hood and cowl support.

C—Cap Screw (2 used)



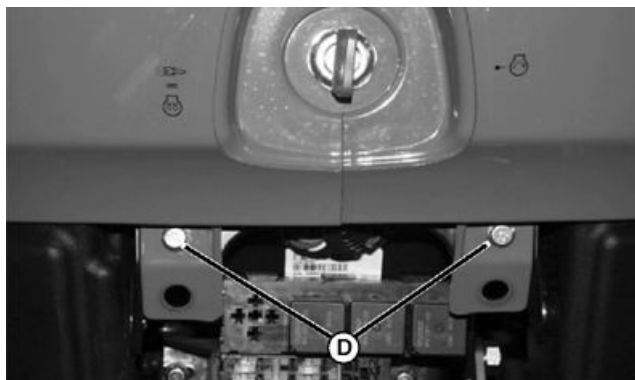
LVAL12627 —UN—29OCT10

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SW03989,0000CEC -19-19DEC12-2/5

10. Remove two cap screws (D) and locknuts securing cowl halves to support bracket behind the fuse panel cover.

D—Cap Screw (2 used)



LVAL12628 —UN—29OCT10

SW03989,0000CEC -19-19DEC12-3/5

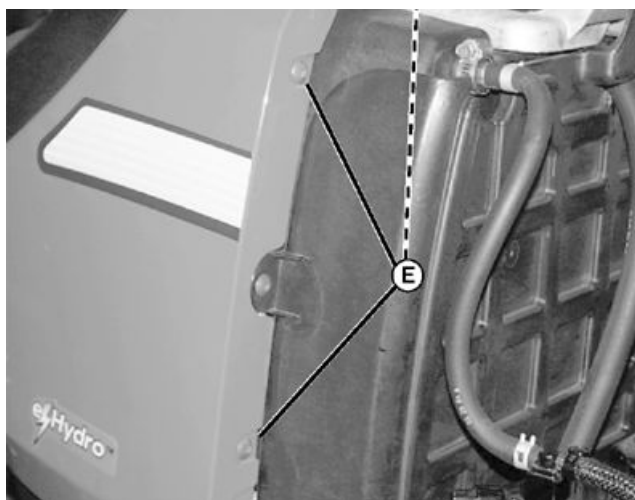
11. Remove three screws (E) at the front of each cowl panel.

IMPORTANT: Avoid Damage! Gently flex the cowl and control panels while removing and installing. Do not over flex or the panels will break.

NOTE: There are two locking tabs at the inside rear of the control panel. One tab interlocks with each cowl panel, linking the three pieces together. The two cowl panels also have tabs that interlock to each other, and not to the control panel, to aid in assembly and fit.

12. Pivot the control panel rearward to disengage the tabs that connect to each side cowl.

13. Pull the front of the side cowls outward to clear the fuel tank and cowl support, then pivot it downward to allow access to the key switch connector.



LVAL12629 —UN—29OCT10

E—Screw (3 used)

SW03989,0000CEC -19-19DEC12-4/5

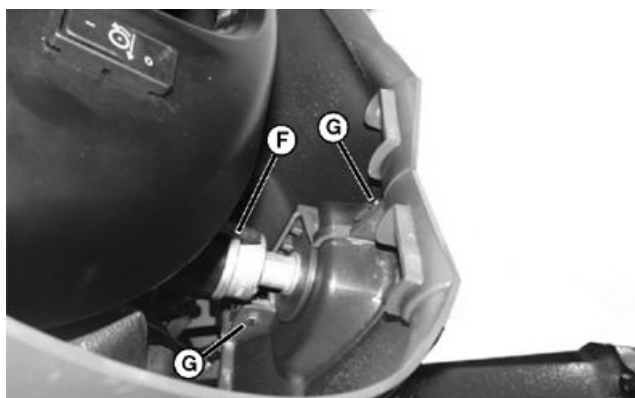
14. Disconnect wiring harness (F) from the key switch.
15. Remove cap screws (G), then pivot cowl panels so that the locking latch can be disengaged to separate the panels.

Installation:

Installation is the reverse of removal.

F—Wiring Harness

G—Cap Screw (2 used)



LVAL12630 —UN—29OCT10

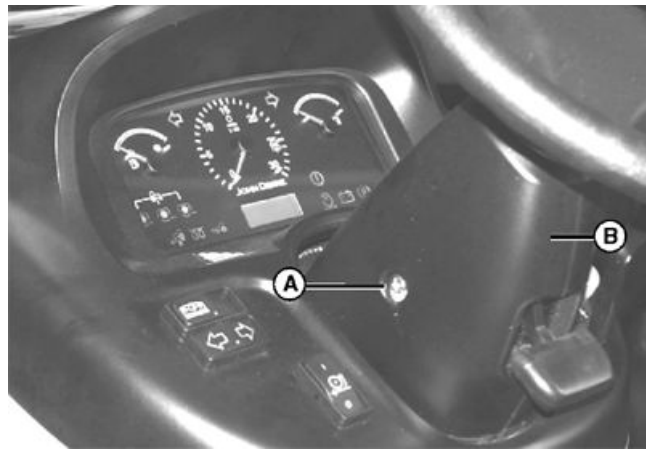
SW03989,0000CEC -19-19DEC12-5/5

Control Panel Removal and Installation

The control panel and the two cowl panels are interlocked when assembled, so all three pieces are involved during removal or installation of an individual component. The key switch is mounted in the left side cowl panel.

Removal:

1. Remove hood. (See Hood Removal and Installation in Section 120, Group 10.)
2. Remove steering wheel. (See Steering Wheel Removal and Installation in Section 100, Group 30.)
3. Remove the two screws (A) securing the steering column covers (B). Remove the covers.
4. Tilt the steering column fully downwards.
5. Remove cowl panels. (See Cowl Panel Removal and Installation in Section 120, Group 10.)



eHydro™ Model Shown

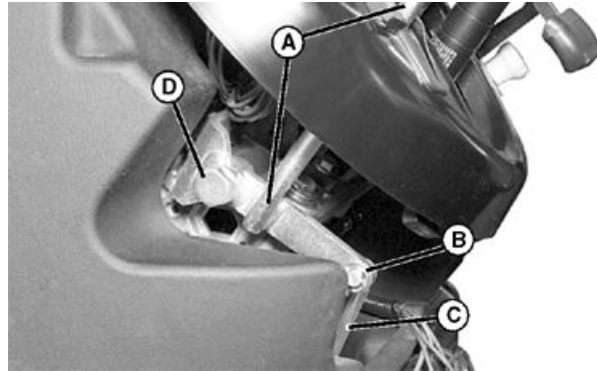
A—Screw (2 used)

B—Column Cover (2 used)

SW03989,0000CED -19-05NOV10-1/2

LVAL12631—UN—29OCT10

6. PRT models: Disconnect PRT shift lever (A) at left side of steering column.
 - a. Remove cotter pin and washers (B) securing shift rod (C) to shift lever and disengage shift rod from lever.
 - b. Remove bolt (D) securing shift lever to the center support and remove shift lever down through slot in the control panel.
7. Disconnect wiring harness connectors to control panel.
8. Remove knob from engine speed control lever.
9. Lift control panel and tilt as necessary to clear the steering shaft and engine speed control lever while removing control panel.



PRT Model Shown

A—PRT Shift Lever
B—Washers (2 used)

C—Shift Rod
D—Bolt

SW03989,0000CED -19-05NOV10-2/2

LVAL12632—UN—29OCT10

Installation:

Installation is the reverse of removal.

Hood Removal and Installation

Removal:

NOTE: Use an assistant to help hood during removal.

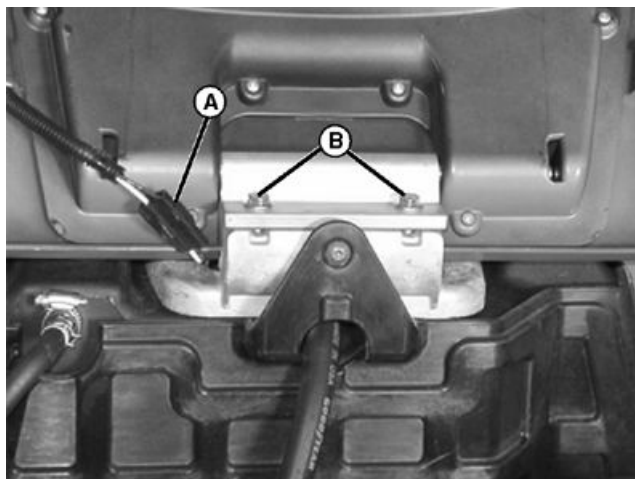
1. Open hood and support on hood prop latch.
2. Disconnect headlight wiring harness connector (A).
3. Raise hood until prop rod end can be removed and raise past center.
4. Remove cap screws (B). Lift and remove hood.

Installation:

Installation is the reverse of removal.

A—Electrical Connector

B—Cap Screw (2 used)



LVAL12633 —UN—29OCT10

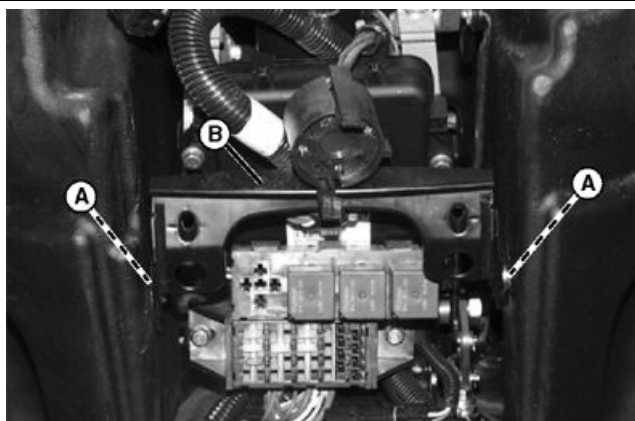
SW03989,0000CEE -19-05NOV10-1/1

Fuel Tank Removal and Installation

Removal:

CAUTION: Avoid Injury! Diesel fuel is flammable!
Extinguish all open flames before working on fuel system. Do not smoke.

1. Park machine on level surface, shut engine off, engage park brake.
2. Allow machine and engine to cool before attempting to service fuel system.
3. Disconnect battery negative (-) cable.
4. Remove hood. (See [Hood Removal and Installation](#) in Section 120, Group 10.)
5. Remove cowl panels and control panel. (See [Control Panel Removal and Installation](#) in Section 120, Group 10.)
6. Loosen two cap screws (A) securing slotted mounting holes of bracket (B) to fuel tank. Remove bracket.



A—Cap Screw (2 used)

B—Bracket

LVAL12634 —UN—29OCT10

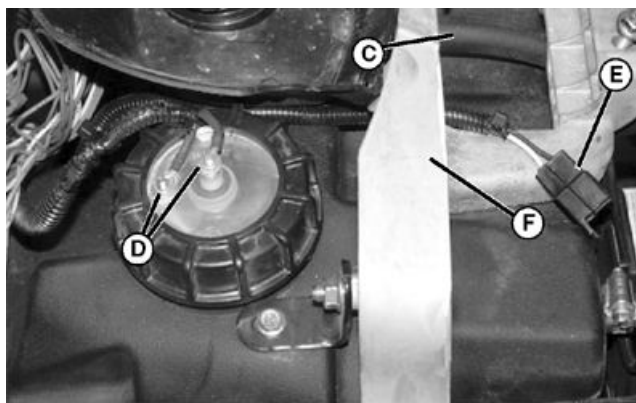
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SW03989,0000CEF -19-05NOV10-1/4

7. Remove drain hose (C).
8. Disconnect fuel sending unit wiring leads (D). Note location of leads for later installation.
9. The wiring harness leads with connector plugs (E) for the headlights join with the wiring leads for the fuel sending unit (D) under the fuel tank support (F). Pull these wiring leads back under the tank support toward the steering column with the main harness so that they will not interfere with tank removal.

C—Drain Hose
D—Fuel Sending Unit

E—Connector Plugs
F—Fuel Tank Support



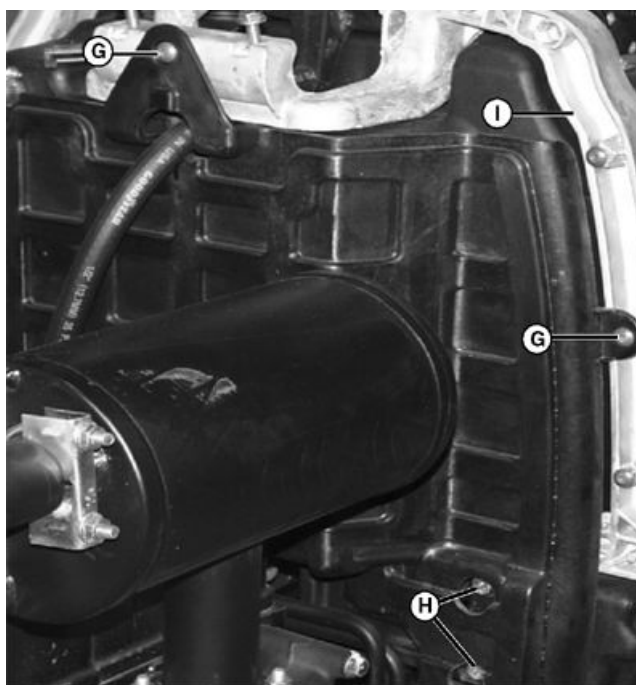
LVAL12635—UN—29OCT10

SW03989,0000CEF -19-05NOV10-2/4

10. Remove three screws (G). Remove heat shield.
11. Remove two cap screws (H) securing the fuel tank support (I) at each side of the machine.

G—Screw (2 used)
H—Cap Screw (2 used)

I—Fuel Tank Support



LVAL12636—UN—29OCT10

Continued on next page

SW03989,0000CEF -19-05NOV10-3/4

12. Remove fuel supply line (J). Drain fuel into an approved container of sufficient capacity. Plug fuel line.

13. Remove and plug fuel return line (K).

14. Remove the push pins securing the front portion of the floor mat. Pull back floor mat to expose fuel tank balance line. Disconnect line from one side of the tank and plug line.

15. Tilt the steering column forward for clearance when removing tank.

NOTE: An assistant should be on the opposite side of the machine to assist in removing or installing tank.

16. Lift the tank and tank support carefully to remove from machine. Be sure that the balance line clears the steering column or other objects.

Installation:

Installation is the reverse of removal.

J—Fuel Supply Line
K—Fuel Return Line

M—Fuel Line



LVAL12637 —UN—29OCT10

SW03989,0000CEF -19-05NOV10-4/4

Throttle Cable Replacement/Adjustment (Auto HST)

Replacement:

1. Park machine safely.

NOTE: Cable can be replaced without removing fuel tank.

2. Remove cap screws (A) and (B) from fuel filter and fuel pump. Disconnect fuel pump wiring (C). Leave hoses connected and set assembly out of the way.

A—Cap Screw
B—Cap Screw (2 used)

C—Fuel Pump Wiring



LVAL12638 —UN—29OCT10

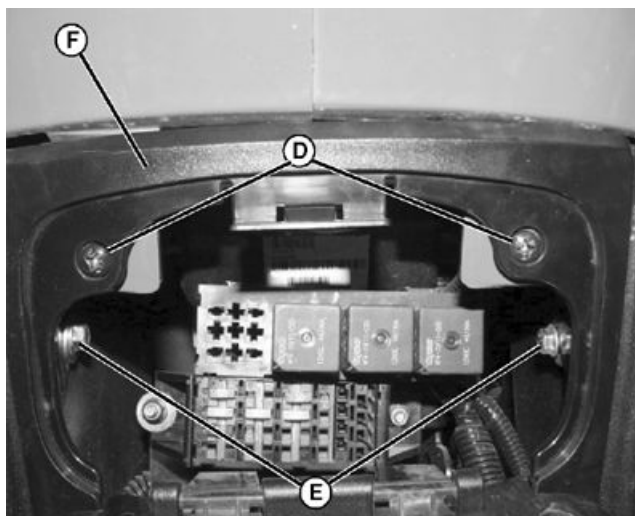
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SW03989,0000CF0 -19-05NOV10-1/8

3. Open fuse panel access door. Remove screws (D) and loosen bolts (E). Remove fuse cover (F).

D—Screw (2 used)
E—Bolts (2 used)

F—Cover



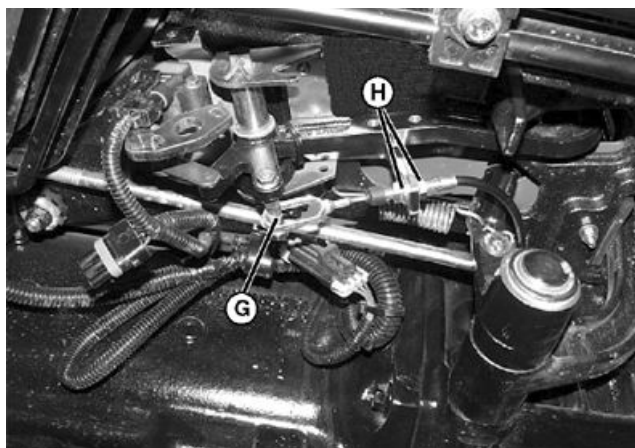
LVAL12639 —UN—29OCT10

SW03989,0000CF0 -19-05NOV10-2/8

4. Loosen jam nuts (H) and remove bolt (G).

G—Bolt

H—Jam Nut (2 used)



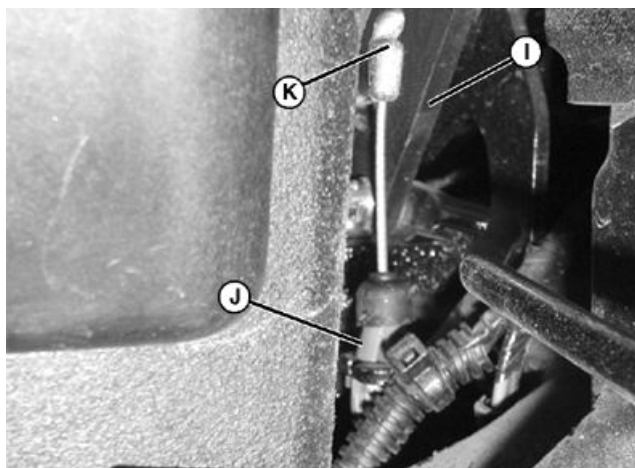
LVAL12640 —UN—29OCT10

SW03989,0000CF0 -19-05NOV10-3/8

5. Locate the bellcrank (I) behind the right rear side of the engine under the fuel tank. Using an extra long needle nose pliers, squeeze tabs (J) together and slide cable housing out of bracket.
6. Turn cable end (K) 90 degrees away from bellcrank to disconnect from bellcrank.
7. Remove the cable from the machine.

I— Bellcrank
J— Tabs

K—Cable End



LVAL12641 —UN—29OCT10

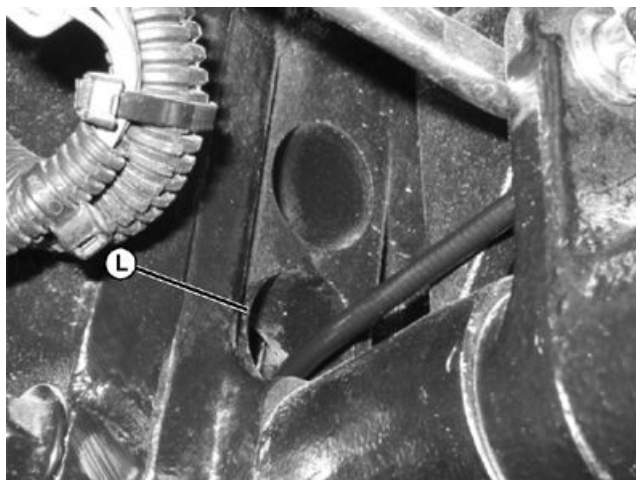
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SW03989,0000CF0 -19-05NOV10-4/8

NOTE: The small end of the cable must be installed through the lower hole in the flywheel housing from the outside. The large eyelet for the pedal end does not fit through the hole.

8. Install the small (top) end of the cable through the lower hole (L) in the flywheel housing.
9. Run a piece of wire down through the top hole of the flywheel housing. Tape the end of the new cable to the wire and pull it up through the hole.

L—Lower Hole



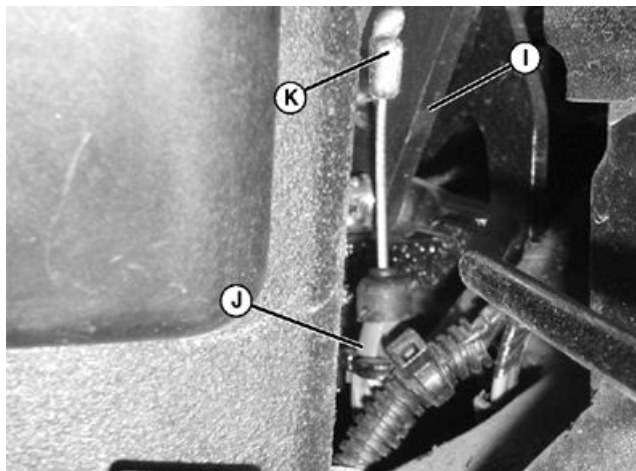
LVAL12642 —UN—29OCT10

SW03989,0000CF0 -19-05NOV10-5/8

10. Attach cable end (K) to the bellcrank (I). Push cable housing up through bracket until both tabs (J) snap out above bracket.

I—Bellcrank
J—Tabs

K—Cable End



LVAL12643 —UN—29OCT10

SW03989,0000CF0 -19-05NOV10-6/8

11. Route cable as shown between brake pedal (M) and brake bellcrank (N).

M—Brake Pedal

N—Brake Bellcrank



LVAL12644 —UN—29OCT10

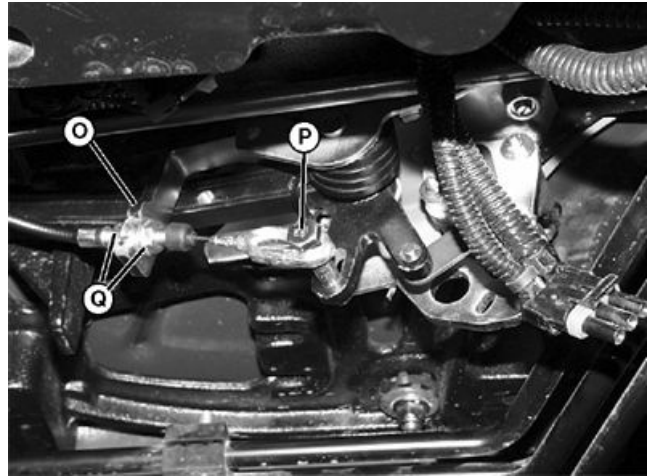
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SW03989,0000CF0 -19-05NOV10-7/8

12. Install throttle cable to bracket (O). Install shoulder bolt (P) through slot in cable end and into pedal arm.
13. Adjust nuts (Q) on throttle cable so that when drive pedal is fully depressed, the throttle lever on injection pump is at full throttle position, and when pedal is released throttle lever returns all the way to idle position.
14. Install fuse panel trim and door.
15. Install fuel pump and filter. Connect fuel pump wiring.

O—Bracket
P—Shoulder Bolt

Q—Nut (2 used)



LVAL12645 —UN—29OCT10

SW03989,0000CF0 -19-05NOV10-8/8

Three Point Hitch Removal and Installation

Center Lift Link Removal:

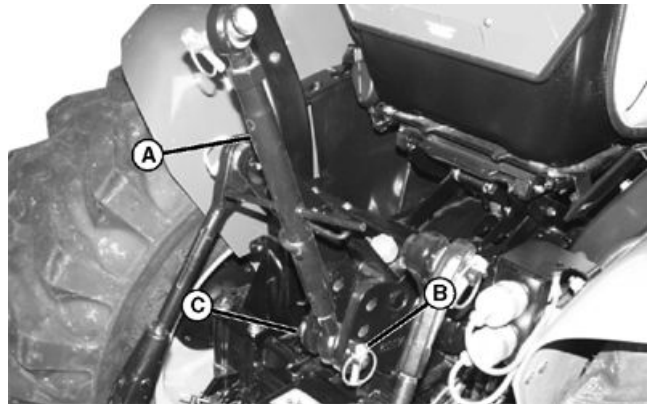
1. Disconnect center lift link (A) from storage hook.
2. Remove lynch pin (B) from hitch pin (C) attaching center lift link to bracket on rockshaft.
3. Support center lift link and remove hitch pin. Remove center lift link.

Installation:

Installation is the reverse of removal.

A—Center Lift Link
B—Lynch Pin

C—Hitch Pin



LVAL12646 —UN—29OCT10

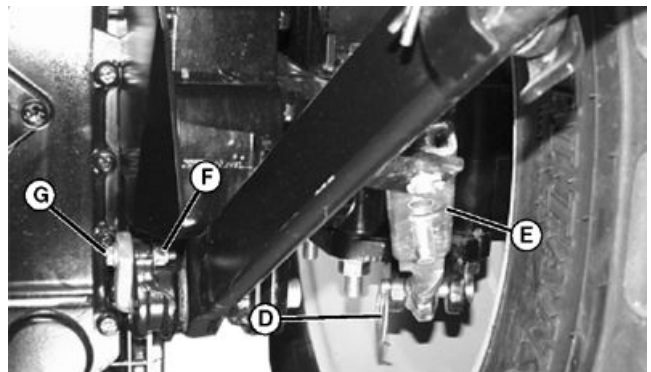
SW03989,0000CF1 -19-05NOV10-1/4

Draft Arm & Adjustable Sway Bar Removal:

1. Lower draft arms completely.
2. Remove spring clip (D) from clevis pin on front of adjustable sway bar (E). Remove clevis pin.
3. Remove nut (F) and bolt (G) from hitch pin on bottom of lift link.
4. Support draft arm and adjustable sway bar (E) and remove hitch pin.

D—Spring Clip
E—Sway Bar

F—Nut
G—Bolt



LVAL12647 —UN—29OCT10

Continued on next page

SW03989,0000CF1 -19-05NOV10-2/4

5. Remove lynch pin (H) from anchor pin at front of draft arm.
6. Remove adjustable sway bar and draft arm.

Installation:

Installation is the reverse of removal.

H—Lynch Pin



LVAL12648 —UN—29OCT10

SW03989,0000CF1 -19-05NOV10-3/4

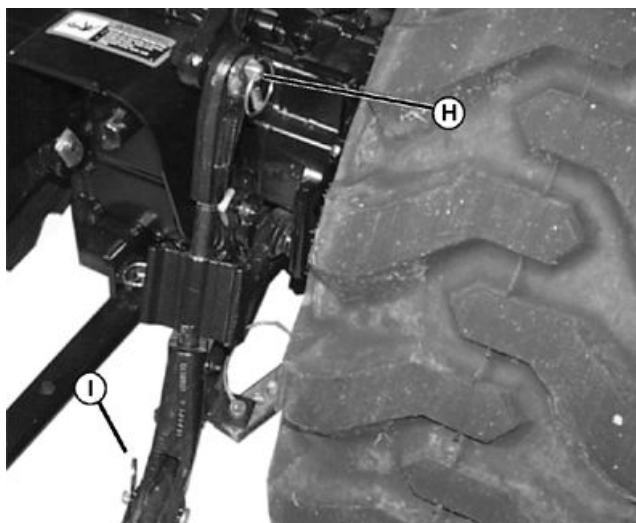
Adjustable (Right Side) and Fixed (Left Side) Lift Link Removal:

1. Remove spring cotter pin (I) from hitch pin on bottom of lift link. Remove lynch pin (H) from rockshaft at top of lift link.
2. Remove lift link.

Installation:

NOTE: Lower hitch pin can be installed horizontally for a fixed connection between the hitch arm and the lift link. The lower hitch pin can be installed vertically to provide movement between the hitch arm and lift link. This allows easier hookup of equipment and rear-mounted equipment to follow ground contours (side-to-side).

Installation is the reverse of removal.



LVAL12649 —UN—29OCT10

H—Lynch Pin

I— Spring Cotter Pin

SW03989,0000CF1 -19-05NOV10-4/4

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